YAMAHA

TX816
TX216

FM TONE GENERATOR SYSTEM

OWNER'S MANUAL

HOW TO USE THIS MANUAL

We would like to take this opportunity of saying thank you for purchasing the Yamaha TX816 or TX216 FM Tone Generator System. You now possess a musical device that will challenge the limits of your imagination. The TX816/TX216 provides you with the means to create sounds that combine acoustic realism and warmth with total digital control. Truly the "best of both worlds"

We suggest that you always read this Owners Manual in the same manner in which it was written--while actually using the TX816/TX216. In this way, anything you read can immediately be put into practice, so that you can effortlessly familiarize yourself with the various modes, functions, and operations.

The TX816/TX216 cannot function by itself. Its performance depends totally on what other MIDI equipment you intend to control it with. Linked with the appropriate MIDI control devices, particularly those in the Yamaha range, it is an extremely powerful digital music tool, and can be utilized in a wide variety of creative ways, both live on stage and in the more controlled environment of the recording studio. As you become more acquainted with your TX816/TX216, new possibilities will reveal themselves to you, and this manual can only serve as a starting point, providing you with all the facts you need to operate this unit, and some examples showing how it can perform as part of suggested MIDI systems.

The INTRODUCTION gives you a description of the various functions incorporated into the TX816/TX216.Once you have read this, we suggest that you carefully read the PRECAUTIONS and CONVENTIONS sections, before connecting up your TX816/TX216 according to the SETTING UP chapter, which also mentions the basic functions of the TX816. This is followed by more detailed chapters on the four main operating modes of the TX816/TX216, after which we offer several useful SYSTEM EXAMPLES.

After the SPECIFICATIONS and BLOCK DIAGRAM, a chapter entitled HOW THE MIDI SYSTEM WORKS is followed by a comprechensive MIDI DATA FORMAT section, for the more computer-minded owner. Finally, a GLOSSARY is provided to explain some of the more technical terms, and a full INDEX allows you to quickly find any information you may need.

This manual also includes a VOICE CHART so that you can keep an accurate record of the 256 voices stored in the TX816, and update it as necessary. A sample voice chart gives some suggestions on how to combine voices, and a blank voice chart is provided, of which you can make photocopies for your own use.

Although most of the information given in this manual applies to both the TX816 and the TX216, we will refer to only the TX816 unless any special mention of the TX216 is necessary. We will also, throughout the manual, assume that you are using a Yamaha DX7 synthesizer to control the TX816.

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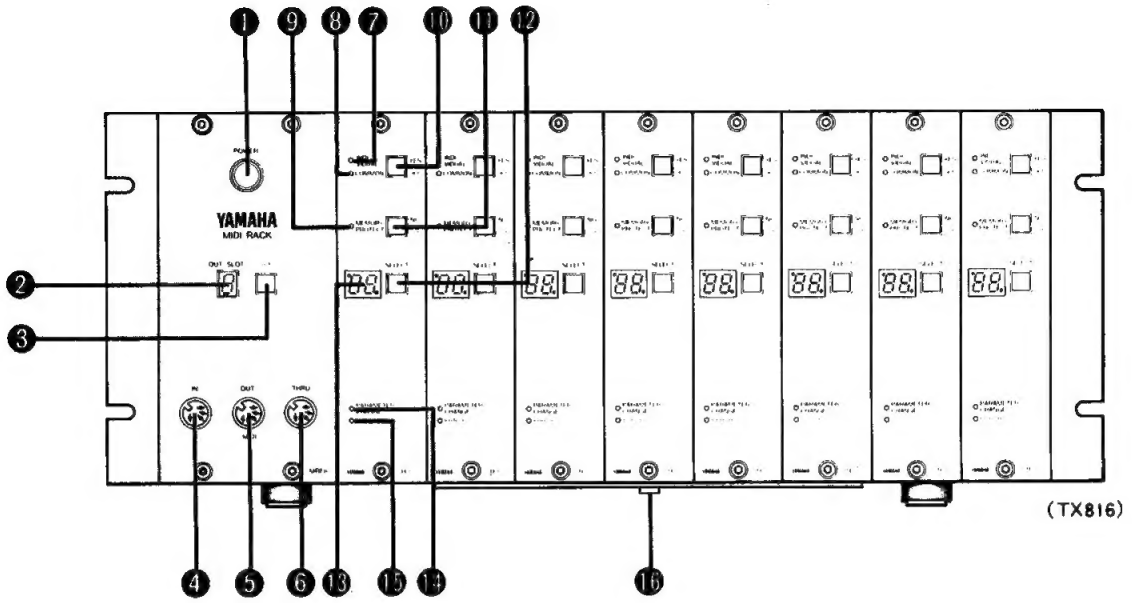
FRONT PANEL FEATURES



1. *POWER Switch*

This push-button power switch has no accompanying LED indicator, as a multitude of function LED's on each module indicate that the TX816 is switched on.

2. *OUT SLOT LED Display*

This indicates the number kof the TF1 mkodule from which data may be transmitted via the MIDI OUT terminal.

3. *OUT SLOT Selector Switch*

Allows you to select the TF1 module from which MIDI data is output via the MIDI OUT terminal. Pressing thes switch adds ont to the number displayed, over a range of 1 to 8.

4. *Common MIDI IN Terminal*

Any MIDI instrument whose MIDI OUT termianl is connected to this termianl can control any TF1 that is switched to COMMON.

5. *MIDI OUT Termianal*

Data from the TF1 module selected by the OUT SLOT Selector Switch is output from this terminal.

6. *MIDI THRU Terminal*

Any MIDI singnal received at the COMMON MIDI IN terminal is output unchanged from this termianl, so that it can be used to control another MIDI device.

7. *INDIVIDUAL LED (orange)*

This lights up when a module is switched to INDIVIDUAL,to receive MIDI signals via its rear panel MIDI IN terminal.

8. COMMON LED (orange)

This lights up when a module is switched to COMMON to receive MIDI signals via the front panel MIDI IN terminal.

9. MEMORY PROTECT LED (red)

This lights up when the TF1's internal Memory Protect feature is turned on. When you turn on the power to the TX816, this will always be turned on. The only reason for turning off the Memory Protect feature is when you wish to store new data. This LED will light for a few seconds while the data is being stored. It should then always be turned on again.

10. SW1-The MIDI IN Select/Data Entry Key

This is a multi purpose push-button feature that enables you to select COMMON or INDIVICUAL MIDI input, and sets data and selects functions, according to which mode the module is in. Generally referred to as "SW1" (switch one), it can act as a " Yes", "On" , or "+1" key. When entering numerical data, pressing this button will add one to the data number, while holding it down will usually increase the data number at a rapid rate.

11. SW2-THE MEMORY PROTECT/Data Entry Key

This turns the Memory Protect feature on or off. It aslo functions similarly and opposite to SW1, and is ususlly called " SW2" (switch two) and can act as a "No", "Off" or "-1" key, with the same press/hold dkown operation modes.

12. SW3-The MODE SELECT Key

This is an ingenious multi-purpose key that enables you to switch between the TX816's four main modes and their 14 Sub- modes, as follows: when you hold this key down it will cycle through the four main modes (indicated on the LED Display) and you select a mode by releasing SW3 when you see the appropriate display. You select a sub-mode by pressing quickly once or up to four times, as explained in the chapters on each main mode.

13. LED DISPLAY

This dispalys numbers, letters and symbols to keep you informed of the current mode or sub-mode status of the module, as well as showing parameter values during editing. When the TX816 is turned on it will display the voice number that was last selected.

14. PARAMETER CHANGE LED(green)

This flashes whenever there is a parameter change due to new voice data or function data being sent from an external source. It will not light up for any parameter changes made by the keys on the front panel off the module.

15. ERROR LED(red)

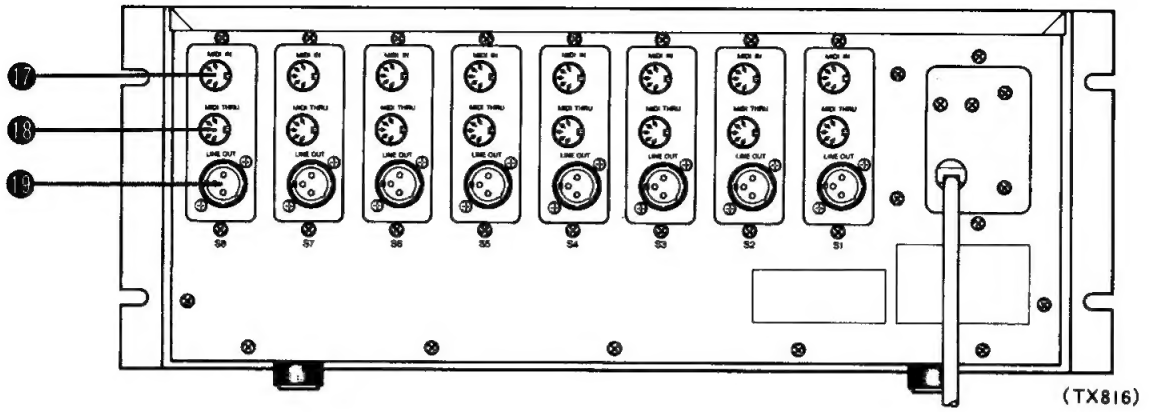
This lights up if there is any kind of data error or fault inside the TF1, and is accompanied by a number on the LED Display, indicating the thpe of error. These are listed in the PRECAUTIONS section. The error display can be cancelled by pressing SW1, SW2 or SW3.

16. PULL-OUT OPERATIONAL GUIDE FOR TF1

Underneath module 4 you will see the tab of a pull-out plastic sheet which gives

a quick quide to the functions of the switches and LED's on each TF1 module. This sheet also explains the Error Displays, and the various modes and sub- modes, and illustrates the appropriate LED Display in each case. So the basic information on the use of the TX816 is always at your fingertips.

REAR PANEL FEATURES



17 Individual MIDI IN Termianl

Any MIDI instrument whose MIDI OUT terminal is connected to this terminal can control this module, provided it is switched to INDIVIDUAL.

18. Individual MIDI THRU Terminal

Any MIDI signal received at the INDIVIDUAL MIDI IN terminal is output unchanged from this terminal, so that it can be used to control another MIDI device.

19. LINE OUT

This balanced line XLR type terminal outputs the audio singal from the mosule's FM Tone Generator. This is normally connected direct to a mixer, amplifier or tapedeck.

INTRODUCTION

The Yamaha TX816 FM Tone Generator System basically consists of eight identical TF1 modules, mounted on a MIDI rack frame. This rack frame supplies the power to the TF1s, and provides COMMON MIDI IN/OUT terminals so that all eight modules may be controlled by a single MIDI signal, or they may be controlled independently. The TX216 contains two TF1s, mounted in the same MIDI rack frame, and you can easily install further TF1s into the TX216 whenever you like, with the possibility of building up to exactly the same system as the TX816. The instructions for adding further TF1s to your TX216 are given in the section entitled ADDING A TF1 TO YOUR TX216.

The tone generating unit incorporated into each TF1 module is equivalent to the one incorporated into the Yamaha DX7 Digital Programmable Algorithm Synthesizer, which has completely revolutionized the world of digital music. And, just like the DX7, each TF1 contains a memory bank which can store the data of 32 different 16-note polyphonic voices. However, these compact modules are actually more sophisticated than a DX7, because, as well as being able to store the 145 parameters relating to each voice, they can store 25 function parameters, for effects such as portamento, glissando, modulation wheel setting, and so on, which can be individually set for each voice. All the voices and functions are available for editing and modifying, so that on the TX816 you can have 256 different voices, which can be considered as 32 sets (or "combos") of 8 voices. This aligns particularly well with the Yamaha QX1 Digital Sequence Recorder, which can store 32 banks (or "songs") each containing eight tracks of music data.

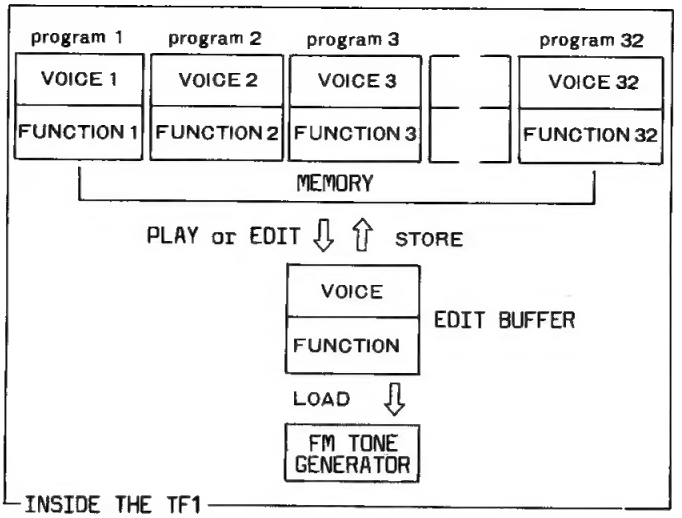
Yamaha's FM Digital Synthesis technique enables you to produce amazingly lifelike acoustic sounds, as well as the more "conventional" synthesizer tones. For the user, it requires a completely different approach to creating voices. There are no voltage controlled oscillators, amplifiers or filters (VCOs, VCAs or VCFs). An entirely unique tone generating technique is used, employing six sine-wave "operators", each with an envelope generator, that can modify each other in billions of ways to produce the complex, moving structures that are characteristic of any acoustic sound. A full description of FM Digital Synthesis is given in the DX series systhesizer owner's manuals.

All the voices in the TF1 modules are controllable using MIDI signals from the DX series synthesizer, the KX series Remote Keyboard, the QX series Digital Sequence Recorder, or the Yamaha CX5M Music Computer. MIDI instruments made by other manufacturers may also be used to control the TX816, but editing voices is only possible with the Yamaha DX7,DX5 or DX1 synthesizers.

Through the use of state-of-the-art microcomputer circuitry, the wide range of functions can be controlled by just three buttons mounted onl the front panel of each module. Each of these buttons fulfills a variety of functions, and together they control all the sophisticated circuitry incorporated into the TX816 and TX216, with ease and efficiency. A superb example of Yamaha's aim to make state-of-the-art digital music technology available to all.

The TX816, and all Yamaha's digital instruments, are MIDI compatible, and may be joined together in a variety of configurations so that each unit may either drive, or be driven by, the others. Explained in detail in the HOW THE MIDI SYSTEM WORKS chapter, MIDI (which stands for Musical Instrument Digital Interface) is basically a universal language that has been created in order to allow digital music instruments to control and drive each other. As the name suggests, digital music instruments convert all musical information into numbers, which are easily handled by computer circuits, and easily transmitted from one device to another. Using extremely simple connections, highly powerful digital music systems may be easily assembled.

There are four basic modes of operation-- Play, Edit, Store and Utility. These are selected by pressing the selector button on the front panel of each module. This button is also used to select the sub- modes, of which there are 14. The LED Display on the front of each module shows you at a glance which mode or sub-mode the TX816 is using. We'll describe them briefly here, and in more detail in subsequent chapters. But first, here's a brief description of what goes on inside a TF1 module:



Data--pure information in electronic form--is stored in the memory of each TF1 module. Each of the 32 "program destinations" in the memory contains two batches of data: voice data and function data. (These will be explained in the Edit Mode section of this introduction).

When you select a voice for playing or editing, this information is transfeffed from the memory to what is called an "Edit Buffer"."Copied" might be a better word than transferred, because the data is still in the memory, where it is protected from erasure.

The Edit Buffer makes the data available to you for editing or playing. If you want to play the TF1, the data is then used to drive hte FM Tone Generator, and an audio signal is produced. Since the sound output of hte TF1 is determined by the contents of the Edit Buffer, you can see that only one voice at a time may be played. This why the TX816 contains eight individual modules. Even if all modules have the same set of 32 voices in their memories, you can select any eight of those voices and play them simultaneously.

If you have edited a voice and want to store it in the memory, the Store mode sends (copies!) the data back to the memory, but only if the Memory Protect is turned off.

THE PLAY MODE

In the Play Mode, which is the basic mode the TX816 enters when it is first turned on, the Tone Generator System is immediately ready to be controlled by another MIDI instrument. A Yamaha DX or KX keyboard is the ideal instrument for this purpose, although any MIDI instrument should be able to play the TX816, and make voice changes.

An incoming MIDI signal can control the TX816 in two ways:

(1) If connected to the COMMON MIDI IN socket on the front of the MODI rack frame, it will control all modules switched to "COMMON". In this way, a single keyboard such as a DX7 can"play" all eitht modules simultaneously.

(2) If connected to an INDIVIDUAL MIDI IN socket on the rear of a module, it will control only that particular module (the module must be switched to "INDIVIDUAL" in this playing mode).

Combinations of the above are possible. For example, you could have a DX7 controlling four modules via the COMMON MIDI IN terminal, and use a KX1 remote Keyboard to control the other four modules via their INDIVIDUAL MIDI IN terminals. See the SYSTEMS EXAMPLES section for further suggestions.

Sub-modes within the Play mode have the following functions:

(a) SET RECEIVE BASIC CHANNEL:

Select Which channel MIDI information is received on. This must be the same as the channel on which your MIDI instrument is transmitting data. NOTE: MIDI information may be sent down a single cable on up to 16 differebnt channels. See HOW THE MIDI SYSTEM WORKS later in this manual.

(b) SET OMNI ON/OFF:

When the Omni mide is turned on, the module can receive MIDI data on all MIDI channels.

(c) TUNE MASTER PITCH:

The pitch okf each module may be altered by+/- 75 cents. Tunning each module to a slightly different pitch makes for a more realistic acoustic sound--a "natural chorus" effect.

THE EDIT MODE

All Yamaha MIDI instrument can extensively program each other through the use of inbuilt "system exclusive information" that other manufacturer's MIDI devices cannot receive. With the TX816, you can edit any of the 32 voices stored in each module, using a DX7, just as if it were an internal voice of the DX7. You can also edit with a DX1, and the smaller DX9 can be used for editing, with some limitations, as its FM Tone Generation System is slightly less sophisticated than the DX7 (in technical terms, it has only four operators per voice as compared to six in the DX7).

There are basically two types of data that can be edited:

(1) Voice Data (145 separate parameters). This is the data that actually creates the sound of an FM voice: the frequency, level, and envelope characteristics of each of the six operators; the keyboard level scaling and keyboard rate scaling settings, and so on. This data is edited using a DX keyboard. The parameters are listed in Table 4-1 in the MIDI FORMAT chapter, and they are explained in full in the DX owner's manual.

(2) Function Data (25 speparate parameters). This applies to parameters that affect the overall performance of a voice, regardless of tis timbre. These include poly/mono selection, pitch bend, portamento, glissando, modulation wheel, foot control, breath control, and after touch, and they are all edited with a DX keyboard, except for the functions described in palragraph (c) below, which may only be edited using the front panel controls on each TF1 voice module.

Sub-modes within the Edit mode have the following functions:

(a) SELECT PROGRAM NUMBER FOR EDIT:

Choose which voice you wish to edit. In this sub- mode the voice may be selected either by using the front panel switches on the TF1, or by pressing the voice select keys on a DX7.

(b) ATTENUATE OUTPUT LEVEL:

Adjust the output level of an individual voice. FM digital voices, with their limitless range of timbres, can vary in level. With this function you can match up levels of different voices-- rticularly useful if you wich to change voices during a performance.

(c) LIMIT LOWEST KEY/LIMIT HIGHEST KEY:

These two functions allow you to allocate each voice to any part of your DX7 or MIDI keyboard. You can simply split the keyboard into two halves; divide it into

eight separate sections, each with a different voice; or overlap voices in any combination.

THE STORE MODE

This provides access to the TF1's internal memory. You can store newly edited voices, or just their function data, in any of the 32 program destinations in the memory, with permanent storage guaranteed by the back-up battery (actually requires replacing after about 5 years). Before storing data, the Memory Protect must be switched off. After storing data, the Memory Protect should always be switched on again.

Sub-modes within the Store mode have the following functions:

(a) SELECT DESTINATION:
Select the program destination in which you wish to store a newly edited voice. In this way you can arrance the 32 voices in the TF1 to exactly suit your performing requirements.

(b) STORE VOICE AND FUNCTION:
Having selected a destination for your new voice and its accompanying function data, this allows you to store this information in the internal memory.

(c) STORE ONLY FUNCTION:
You can also choose to store only the function data in a selected program destination, without affecting the voice data stored there. This is useful if you want to rapidly change the function data of several voices; for example, giving a group of voices the same portamento setting.

THE UTILITY MODE

As the name suggests, the Utility mode allows you carry out various data- handling jobs, rather than create new data.

Sub-modes within the Utility mode have the following functions:

(a) DAMP ALL VOICES AND FUNCTIONS:
All of the voice and function data may be dumped (output) at one time through the MIDI OUT terminal on the MIDI rack frame. This could be used for transferring data from one TF1 module to another. If you dump data into the internal memory of a DX7 (in this case, voice data only will be received) it can be stored in a RAM (Random Access Memory) cartridge, so that you can then create new voices in the TX816. You can also dump voice data onto the floppy disk in a QX1. In this way, you can easily and inexpensively build up a library of voices that will expand as your musical requirements grow.

(b) CLEAR AND INTIALIZE ALL FUNCTIONS:
Reduce all functions stored in the memory to their original setting i.e., the value they are set at before leaving the Yamaha factory. Each module is factory programmed with the same voice set as the DX7. In the TX816 and TX216, however, appropriate function data is also factory programmed for each voice. A table in the UTILITY MODE chapter lists these functions and their initial values. You could use this feature after you have dumped all the function data from a module, and wish to initialize everything prior to creating a new set of voices.

(c) AUDIO CHECK:
An audio check feature that provides a standard 440 Hz sine wave tone at -4 dBm. Useful for checking system connections and modules, and setting levels on your mixer or tapedeck.

(d) READ OUT CURRENT VOLTAGE OF BATTERY:

This allows you to make instant checks on the level of the Lithium battery which acts as a back-up for the data memory of the TX816. The battery has a normal life of about five years, and should be changed when its level falls below 2.3. volts. This shows as "23" on the LED.

Now let's see about setting up the TX816 and playing...

PRECAUTIONS

NOTE:

Read this section throughly before setting up your TX816. This unit uses state-of-the-art computer technology which, though outstandingly durable and reliable, requires certain working conditions in order to carry our its sophisticated functions efficiently and accurately.

LOCATION

Avoid placing the TX816 in direct sunlight. Any extremes of temperatures should also be avoided, as they can cause errors in data storage and transmission. The microcomputer circuitry employed in the TF1 FM tone generating module is designed to function best within a "normal" temperature range. If you are using your TX816 in temperatures over 40 deg.C (for example, at an outdoor concert in a hot climate) it is recommended that you use a cooling fan to keep it at a lower temperature.

Extremely high humidity or dry conditions shiuld be avoided, as should excessive dust or vibrations. The TX816 performs as efficiently onstage as it does in a studio--provided you treat it as you would a fine automobile--with care and caution.

Ensure that the ventilation grills on the upper and lower surface of the TX816 are uncovered so that air may circulate freely to eliminate any risk of overheating.

It's also advicable to set the TX816 at a convenient height for you to operate. You should be easily able to reach the switches on the front panel, as these may be used constantly during an editing session. You should also ensure that you can get a good front-on view of the LED indicator on the front panel of each TF1. If you look at them from too great an angle, you may miss parts of the LED Display.

If you intend to experiment with different MIDI connection configurations (this can be highly creative and rewarding) you will also require easy access to the rear of the unit, as it is preferable not to move the unit while it is switched on.

The MIDI rack frame is built to the internationally standard 19" (480mm) width, so for permanent installation your TX816 may easily be rack mounted in a studio.

CLEANING THE EXTERIOR PANELING

To remove dirt or fingermarks from the exterior paneling of the TX816 it is best to use a soft, dry cloth that will not shed any fluff. It is not advisable to use any solvents such as benzine or thinners. Do not use any aerosol sprays near this unit--they can get into the circuitry and prevent accurate storage and transmission of data.

EFFECTS ON OTHER ELECTRICAL EQUIPMENT

The TX816 contains innumerable innumerable digital circuits. It may cause static interference with radios or televisions in close proximity. It is advised that you keep these types of equipment as far away from the TX816 as is coknveniently possible.

POWER SUPPLY

The TX816 consumes 7i0 watts of power. The TX216 consumes 20 watts. Their voltage rating is as follows:

U.S. and Canadian models: 120 V (50/60 Hz).
General model: 100-120/220-240 V (50/60 Hz) Voltage selector incorporated.

Ensure that the correct voltage is selected if you have tha general model. If you are not going to use the TX816 for a few days or more, it is advisable to unplug it from the AC power supply. It is also wise to unplug it during

Thunderstorms, as power surges caused by lighting may affect stored data.

ERROR DISPLAYS

Anumber of error displays are built into each TF1 to let you know if any internal problems are occurring. The red Error LED will light, and a number will appear in the LED Display to inform you of the type of problem. You can cancel the error display by pressing any of the three keys on the front of the module. The following chart lists the ten types of errors, and how to deal with them.

LED DISPLAY	ERROR	REMEDY
1	Data Receive Error	Indicates that data has not been properly received. Adjust thedata at the sourst and transmit data again
2	Receive Buffer Full	
3	Bulk Data Check sum error	
4	Low Battery Level	Replace Battery
5	ROM Hardware Error	These errors are all caused by a fault in the internal circuitry the TF1, and you will need to contact your nearest yamaha dealer
6	RAM1 Hardware Error	
7	RAM2 Hardware Error	
8	RAM3 Hardware Error	
9	RAM4 Hardware Error	
10	Trap Error	

KEEP THIS MANUAL

Keep the Owner's Manual in a safe place. Even though you may have become totally familiar with the TX816, tuture reference to the manual may will prove to be highly informative.

IF YOU ARE USING A DX7 OR KX1

If you possess a Yamaha DX7 synthesizer or KX1 remote keyboard that was manufactured before MIDI Version 1,0 was finalized, you may find that the after-touch does not function when using one of these keyboards to control the TX816. In this case, contact the store where you purchased your keyboard and ask them to replace the ROM system. Models with the following serial numbers will require this update modification:

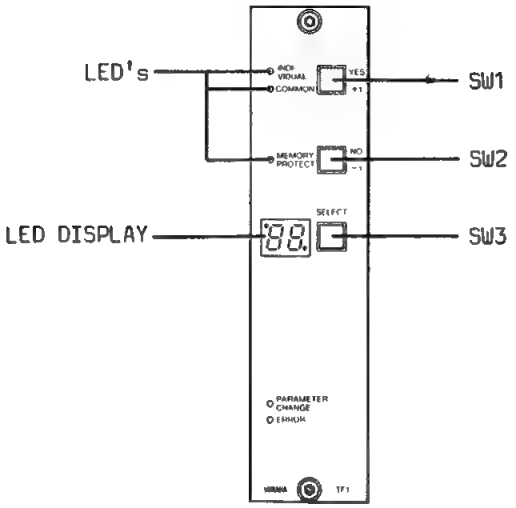
DX7: Serial Nos. 1001--24880, 25125--26005.

KX1: Serial Nos. 1001--1105.

CONVENTIONS

The following simple conventions are used to make this manual easier and quicker to read.

1. The switches on the front panel of each voice module are multi-purpose switches which will be referred to in the text simply as SW1, SW2 and SW3 (reading from top to bottom of the panel). The FRONT PANEL FEATURES section explains the functions of these switches.

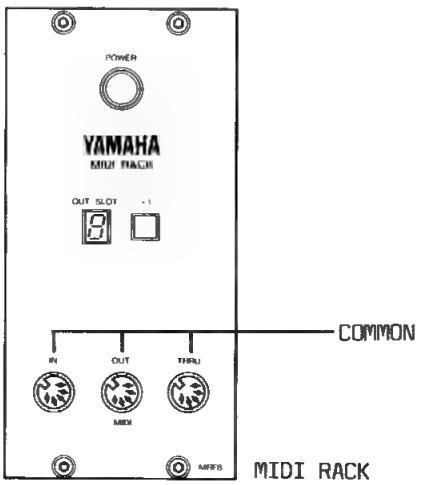


TF1-FRONT

2. All these switches may be used in two different ways: (a) by pressing and relasing immediately, to change data in single increaments (pressing and relasing SW3 will switch the module from one SUB- MODE to another SUB-MODE): (b) holding down a switch, to change data continuously and rapidly until the key is relased (holding down SW3 for longer than two seconds will switch the module from one MODE to another MODE).

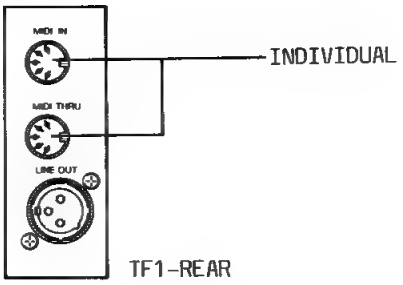
In the text, then, the words "press" and "hold down" will always be used to indicate these two different actions.

3. The MIDI terminals on the front panel of the MIDI rack frame are referred to as "COMMON" as they provide access to all modules. ("COMMON" is not always applied to the MIDI OUT terminal as it is the only MIDI OUT TERNINAL on the TX816).



MIDI RACK

4. The MIDI terminals on the rear of each voice module are referrd to as "INDIVIDUAL" as they provide access only to the module in which they are installed.



5. The indicators on the fornt panel of each module are of two basic types: LED's (small coloured lights) of which there are five; and the LED Display (an indicator that displays one or two digits or letters, similar to some watches or calculators). The words "LED" and "LED" Display" will be used to differentiate between these two types of indicators.
6. Wherever the LED Display is illustrated in the text, we will use the following conventions:

Program number: 32* unless another number  is required.

Flashing display: 

Alternating display: 

* In the case of variable numerical data, such as program number, note limit, MIDI channel number, tuning setting, etc., the examples given in the text may not necessarily conform with the numerical LED Display you see when you operate the TX816. The full numerical data range of each function will be mentioned in the text.

SETTING UP

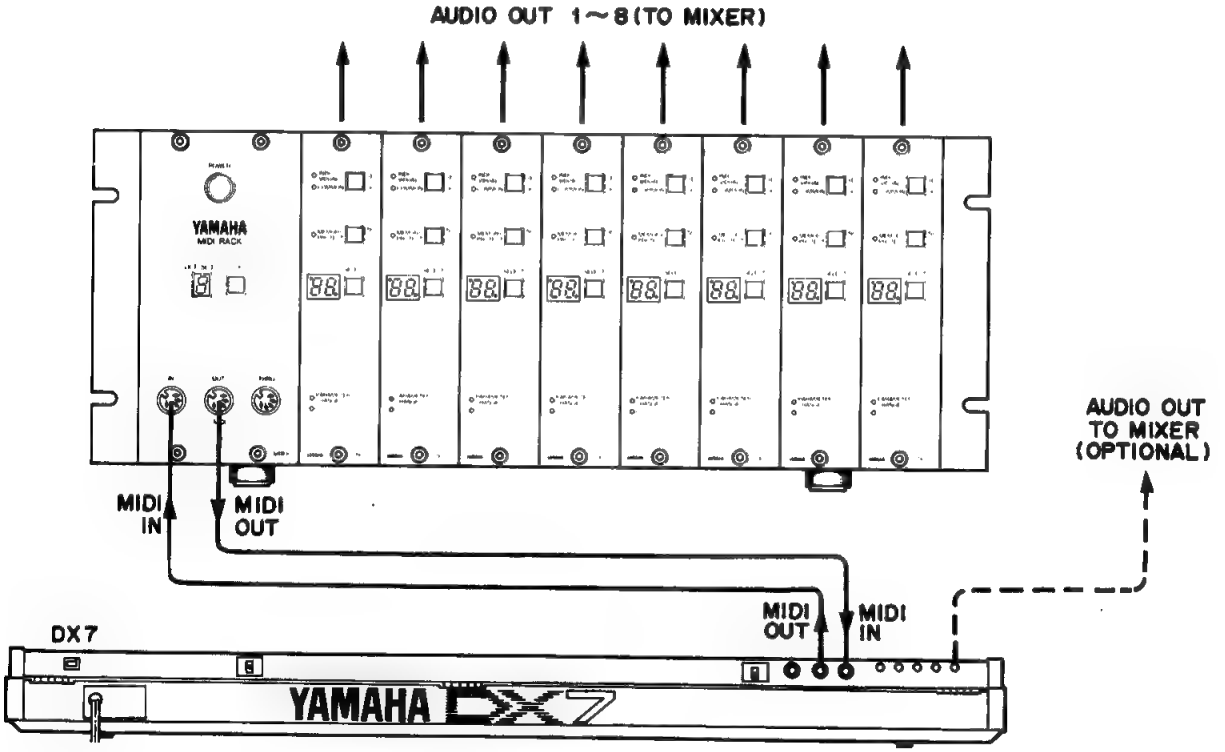
Please read the PRECAUTIONS section before setting up your TX816. The TX816 is not a complicated unit to use, but it requires certain optimum working conditions and,j although highly reliable, it should be treatead with awareness and care.

Make all audio and MIDI connections before connecting the equipment to the AC supply. Do not apply and unnecessary force to switches or terminals.

Always remove cables by grasping the plug, not by tughging on the cable, otherwise damage may occur.

The FM digital voices created by the TX816 are rich, complex, and exceptionally pure and distortion-free. We recommend that you use high quality amplifiers and speakers with full frequency response, to get full enjoyment of this extraordinarily powerful device.

THE BASIC SYSTEM



To illustrate most of the modes and functions on the TX816, we will assume, throughout this manual, a basic system comprised of the TX816 with a DX7 keyboard. If any other equipment is needed to demonstrate certain functions, or if there are any special instructions needed if you are using a TX216, this will be explained in the text. Prior to actually setting up this system, please read this entire SETTING UP chapter. If you are not using a DX keyboard, but are linking alternative MIDI control devices to the TX816, this chapter will still contain much vital information.

For the basic system you will require:

* A Yamaha TX816 FM Tone Generator System.
* A Yamaha DX7 Programmable Algorithm Synthesizer.
* A high quality eight channel mixing console, with at least eight input channels. (An amplifier with two inputs would be sufficient for the TX216, as it only has two audio outputs).

The audio output on each TF1 module has an impedance of 600 ohms and is rated at -10dBm.

* A high quality power amp/speaker system. Stereo is preferable, for full enjoyment of the TX816's sight voices.
* Two standard MIDI cables.
* Eight balanced line audio cables with XLR type connections. (For the TX216, two cables are sufficient).

MIDI CONNECTIONS

The TX816 receives highly complex information via MIDI cables, so only MIDI standard DIN cables should be used, like the ones that are supplied with the TX816. If you wish to purchase further MIDI cables, we recommend the Yamaha MIDI-03 and MIDI-15 cables (3 metres and 15 metres long respectively). MIDI cables longer than 15 meters should not be used, as the MIDI signal can deteriarate if sent over too long a distance, and data errors may result.

(a) Make sure that the TX816 and the DX7 are not connected to the AC supply. Connect the MIDI OUT of the DX7 to the COMMON MIDI IN on the front of the TX816 MIDI rack frame. This enables the DX7 to send MIDI data to the TX816, and "play" the eight voice modules.

(b) Connect the MIDI IN of the DX7 to the COMMON MIDI OUT on the front of the TX816. This enables the TX816 to dump voice data into the DX7's internal memory.

AUDIO CONNECTIONS

Each TF1 module in the TX816 has a balancaed line XLR type output on its rear panel. This connector is wired in the following manner: Pin 1: Shield: pin 2: Hot: pin 3 cold. FM digitally generated voices are subtle and complex, and we recommend that you use the highest quality of cables abailable to connect your TX816 audio outputs to your mixer,amplifier or tape deck.

(a) Make sure that the TX816 and your mixer are not connected to the AC mains. Connect the eitht audio aouputs on the back of the TX816 to eight line inputs on your mixer (the inputs must be suitable for a 600 ohm signal rated at -10 dBm). The easiest method is to connect outputs 1 thru 8 of the TX816 to input channels 1 thru 8 on your mixer. You can adjust input channel sensitivity using the audio Check Signal, as described later in this chapter.

(b) As an option, you can connect hte audio output of the DX7 to your mixer if you with. This will give you a total of nine voices which can be played simultaneously. However, to hear more clearly how the DX7 controls the TX816, it is better not to use this option to begin with. NOTE: The volume control lever on the DX7 will not affect the volume of the TX816 voices.

AC POWER

Once you have made all your MIDI and audio connections, you can now connect all your equipment to the AC mains supply. The poser requirements of the TX816 and TX216 are as follows:

U.S./Canadian models: 120V (50/60 Hz). General model: 110-120/220-240 V (50/60 Hz)> Voltage selector incorporated.

Ensure that the voltage selectors is seitched to the correct setting for your area, if you have tha general model.

Once this is done, turn on your equipment in the following sequence:

(a) Turn on your DX7 first. NOTE: if you switch on the DX7 after turning on the TX816, the ERROR LED on the front of any of the TF1 modules switched to "COMMON" will light, and the LED Display will show a "1". You will now have to press any of the three switches on the fornt of the module, to reset it.

(b) Turn on the TX816 by pressing the power switch on the fornt of the MIDI rack frame. All of the LEDs on the front panel will light up, and then after about two secontd there will be an audible click and a program number (voice number) will appear in the LED Display on each module, indicating that they are now in the Play mode and ready to use. At the same time, some of the other LEDs will go out.

Each module should now have 3 LEDs lit: the LED Display (a number); the Memory Protect LED (the Memory Protect function is always turned on when you turn the tX816 power on, even if it was turned off the last time the unit was used);and either the INDIVIDUAL or COMMON LED.

(c) Turn on your mixer and power amp/speaker system.

AUDIO CHECK PROCEDURE

You can now set your mixer input sensitivities using the TX816's built-in AUDIO CHECK. This is done for each individual TF1 module, using the following procedure:

(a) Hold SW3 (the SELEDT key) until you see the [UF] display, then immediately release the key. This will take about 4 second, and will be preceded by the [Ed] and [SF] displays. The TX816 is now in the Utility mode. If you held SW3 down too long and have "gone past" this mode, keep holding SW3 down until you see the correct display.

(b) Select the AUDIO CHECK SIGNAL sub-mode by briefly pressing SW3 three times. You should now see the alternating LED Display [L]↔[_] . This shows that the AUDIO CHECK SIGNAL is ready to be activated. if you have "gone past" this sub-mode by pressing SW3 too many times, press SW3 repeatedly until you see the correct display.

(c) Set the input channel sensitivity on your mixer to its minimum, then turn on the AUDIO CHECK SIGNAL by pressing SW1. The LED Display will now show [L]↔[¯] .

The TX816 will now be producing a standard 440 Hz tone at -4dBm, and you can adjust the input sensitivity on your mixing console to match this.

(d) Once you have adjusted your input sensitivity, you can go straight back to the Play mode by holding down SW3 until you see the program number in the LED Display.

(e) Now repeat the same procedure (paragraphs (a) to (d) above) for the other seven TF1 modules. (In the case of the TX216, of course, there is only one more module to check, after which you can continue on to the next section).

BASIC OPERATIONS

You can now play the preset voices in the TX816 form your DX7. Here's how it's done:

(a) Switch all modules to "COMMON", by pressing SW1. The COMMON LED's will light on each module.

(b) You will now find that, as you press the voice selector keys on the DX7, all eight modules on the TX816 will switch to the same program numbers, which will be indicated on all their LED Displays. You can now play all eight modules simultaneously from your DX7. Switch form one set of eight voices to another, and enjoy the different combinations that are available to you at the touch of a DX7 voice select key.

And now, here's how you can change the voices of individual modules, and create different combinations of eight voices.

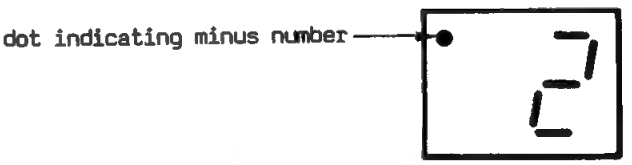
(c) Switch all of the modules except one to "INDIVIDUAL". You can now play only the one that is left in the "COMMON" mode. Set this one to a desired voice by selecting a voice on the DX7. Then switch the module to "INDIVIDUAL. With all modules in "INDIVIDUAL", no sound will come from the TX816 when you paly the DX7.

(d) Switch another module to "COMMON" and select another voice. Then swicth it back to "INDIVIDUAL". Continue through the eight modules in the same manner, setting each one to a defferent voice.

(e) And now--the moment of truth! switch all modules to "COMMON" and play the DX7. You will hear your personally selected combination of eight voices-- an impressive sound which will be even more magnificent if you have arranged the eight voices in a stereo pattern (one good way is to have voice 1 on the left, voice 8 on the right, and the other voices spread out between them).

You'll notice that the orange "COMMON" LEDs on the TX816 are flashing while you play. This shows that MIDI data is being received by the TX816: data that indicates "Key On" when you hit a key, "Key Off" when you release a key, and "Pitch Bend", "Modulation Wheel","Sustain Footswitch", "After Touch" and so on when you use the various functions.

(f) Here's how you can make it sound even more impressive: by slightly detuning each module. Start with module 1. Select the TUNE MASTER PITCH sub-mode by pressing SW3 briefly three times. The LED Display will show TU ↔ -2 .



This example indicates that you are in the TUNE mode and that the tuning is set at minus two (minus numbers are indicated by a dot in the upper left corner of the LED Display). The tuning setting can vary from -64 to +63.

(g) Set the tunig to zero, by pressing either SW1 or Sw2, to increase or decrease the pitch number. Pressing either of these switches will add or subtract one from the pitch number. Holding a switch down will rapidly and continuously change the tuning.

(h) Press SW3 briefly to get out of the TUNE mode and back to the PLAY mode. The LED Display will now whow the voice number selected for this module.

(i) Return to paragraph (f) and repeat the tuning procedure for the other seven modules. Do not tune them all to zero, however. We suggest trying the following seven setting (in any order you wish): 3, 6, 9, 12, 15, 18, and 21.

(j) Upon playing the DX7 again, you should now find a drastic improvement or "enlargement" of the sound, a more orchestral feeling created by each voice being slightly out of tune with the others, just as in a real orchestra. You can go on to experiment with different tunig settings for different effects.

Switching sll modules to the same voice while detuned shows you clearly the "chorus" possibilities of this detuning function. You can do this right now by simply selecting another voice on the DX7. As all modules are in "COMMON", they will all now switch to the same voice. Notice how the detuning effect works differently on percussive voices and sustained, wind voices. Percussive voices can ususlly take a lot more detunig.

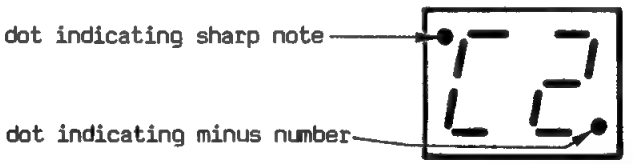
NOTE:

With the TX216 the chorus effect produced by detunig will not be as rich and full, ad there are only two voice modules. However, you can use the audio output of the DX7 to add a third voice, which will immediately give a "thicker", more vibrant effect.

(K) Here's another experiment you can try: Keyborad splitting as you've never heard it before. First of all, set each module to a different voice again (see paragraphs (c) to (e), above).

(l) Set all modules to the Edit mode by holding down SW3 until the LED Display changes to [Ed] , which is the next mode after the Play mode. You will soon get the hang of pressing SW3 on all eight modules at the same time when, as in this case, you have to make the same change on all eight modules.

(m) Press SW3 three times to select the LIMIT LOWEST KEY function. The Led Display will show [Lo]↔[C2] .



This example indicates that the lowest note limit is set at note C sharp on octave -2; the small dot in the lower right corner of the LED display indicates a negative number: the small dot in the upper left indicates a sharp note.

(n) By holding down SW1 to increase the setting, set modules 3 and 4 to [C2]. Similarly, set the other modules as follows:

Modules 5 & 6 : [C3]

Modules 7 & 8 : [C4]

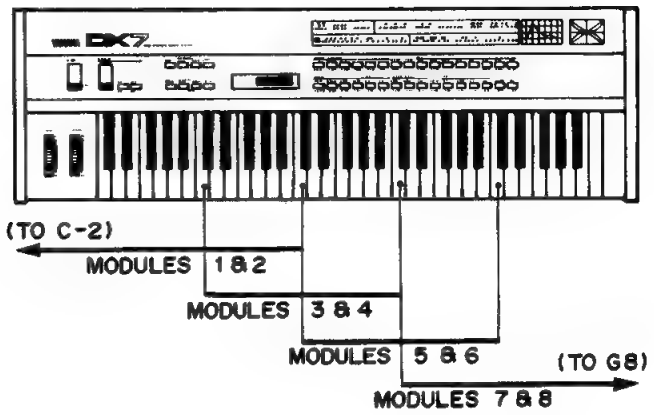
(o) Press SW3 on all modules to select LIMIT HIGHEST KEY. The LED Display will show [H.C-2] . Set the modules as follows:

Modules 1 & 2: [C3]

Modules 3 & 4: [C4]

Modules 5 & 6: [C5]

(p) Hold down the SW3 key on each module until the voice number returns kon the LED Display, indicating that you are in the PLAY mode. This display will be preceded by the [SF] (STORE MODE) and [UF] (UTILITY MODE) displays.



(q) When you play the DX7, you will now find the voices allocated to the keyboard as the illustration shows. You can easily experiment with this sophisticated keyboard splitting device, and further suggestions are given in the relevant section of the EDIT MODE chapter.

These, then are a few of the operations of the TX816, made remarkably easy and rapid by Yamaha's economical design approach. We will now move on to explain each function of the TX816 in more detail, starting with the PLAY mode.

THE PLAY MODE

The play mode is automatically selected when you turn on the power to the TX816. If, however, you have already been using your TX816 and it is currently operating in another mode, you enter the Play mode by holding down SW3 until you see a number from 1 to 32 appear on the LED Display, at which point you release the SE3 key. The main modes are displayed in the order in which the corresponding chapters appear in this manual, so when you hold down SW3 you will see the following sequence:

(the -- appears between each change of mode).

All functions set in the Play mode are common to all 32 voices in each module. When you enter the Play mode, the LED Display will show the Program Number (or voice number) from 1 to 32. This number will change when a program change MIDI signal is received at the MIDI IN terminal.

In other words, if you select a voice by pressing a Vioce Select key on the DX7, the new voice number will appear on the LED Display, and the voice data will be loaded into the Edit Buffer.

If the LED Display shows CA instead of a voice number, it indicates that the DX7 is in SYS INFO AVAIL, and has sent its own voice into the Edit Buffer, instead of the TF1's voice. The DX7 shoule be set to SYS INFO UNAVAIL to switch the voices in the TF1.

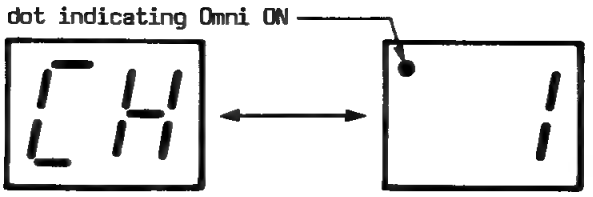
SWITCH FUNCTIONS

In the Play mode SW1 selects "INDIVIDUAL" or "COMMON". Orange LED's on the front of the module indicate which of these two Play modes have been selected. "INDIVIDUAL" means that MIDI singals received at the INDIVIDUAL MIDI IN terminal on the rear of the module will control the module."COMMON" means that MIDI signals received at the COMMON MIDI IN terminal on the front of the MIDI rack frame will control the module. SW2 switches the Memory Protect on and off. A red LED on the front of the module incicates when the Memory Protect is ON. If the Memory Protect is set to OFF when you turn the TX816 power off, it will automatically be turned ON again the next time you turn the power on.

These switch functions are identical when you first enter any of the four main operating modes, but they change when you enter any of the sub-modes within each main mode.

SW3 selects the sub-modes within the play mode. The headings of each of the following sub-mode descreitions indicate the number of times you press SW3 to enter the sub-mode, starting from the main mode display, not from another sub-mode. For example, the Limit Highest Key section in the Edit Mode chapter indicates "press SW3 four times". The procedure then is to hold down SW3 until you see Ed)the Edit mode LED Display) then press SW3 four times until you see the Limit Highest Key Led Display (H, alternating with a note number).

1. Set Receive Basic Channel (press SW3 once)

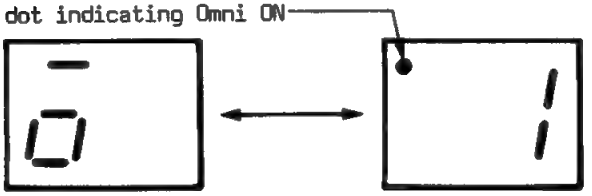


This allows you to select which MIDI channel data is received on. This must be set to the same channel as the instrument that is sending MIDI data to the module.

MIDI information can be sent over 16 channels. The SYSTEM EXAMPLES section shows where this selection can be useful, and the HOW THE MIDI SYSTEM WORKS chapter gives more details on MIDI. Select a channel by pressing SW1 (to go to the next higher-numbered channel) or SW2 (to go to the next lower-numbered channel). Holding down either of these switches let you move rapidly through the sixteen channel numbers until you find the one you want.

The LED Display example above shows that the TF1 is set to MIDI channel 1. The small dot in the upper left corner of the LED display will appear if the Omni mode is on.

2. Set Omni On/Off (press SW3 twice)

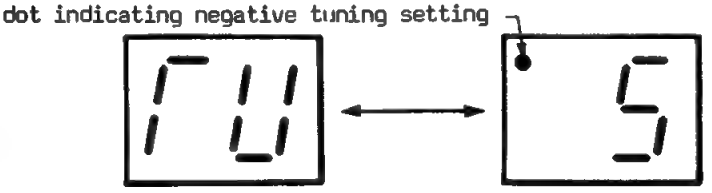


The Omni mode, a standard MIDI function common to many MIDI instruments, allows the module to receive MIDI data regrdless of what channel it is being sent on.

Select YES or NO (i.e. ON or OFF) by pressing SW1 or SW2 respectively.

The LED Display example indicates that the module is set MIDI channel 1. The small dot in the upper left of the LED shows that the Omni mode is ON. When you switch it OFF, it will disappear.

3. Tune Master Pitch (press SW3 three times)



As shown in the SETTING UP section. the Tune Master Pitch sub-mode lets you alter the pitch of an individual module. All 32 voices will be equally modified--it is not possible to tune an individual voice.

The tuning is indicated by numbers ranging from -64 to +63. Each increment changes the pitch by 1.2 cents (a cent = 1/100 of a semitone) so the overall range available is about +/− 75 cents. This allows you to finely tune the TX816 to any accompanying instruments, or detune individual modules to create pleasing natural chorus effects, making the FM voices sound even richer and more authentic. Thorough investigation of this feature will prove very rewarding.

SW1 raises (sharpens) the pitch by single increments if pressed, and rapidly if held

down.

SW2 lowers (flattens) pitch in the same way.

NOTE:

the data entry lever of the DX7 can be used to control the tuning on the TX816. This can be useful during a performance, if tuning adjustments need to be made while playing. Or, if using the audio output from the DX7 as well as from the TX816 or TX216, chorus effects could be controlled from the DX7 by the data entry lever, because if the DX7 is in its normal playing mode, the data entry lever will affect the pitch of only the TX816, not the DX7, so you can detune the TX816 in relation to the DX7's internal voice.

If you set the DX7 to its MASTER TUNE ADJUST function, it will then automatically match the TX816 to its own pitch, and you can use the data entry lever to tune the DX7 and TX816 simultaneously.

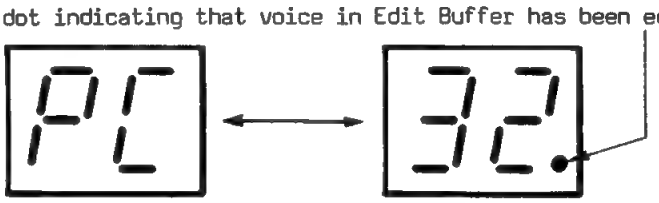
The LED Display example above shows that the module is tuned 6 cents below concert pitch. The negative (flattened) pitch is indicated by a small dot in the upper left of the LED display.

THE EDIT MODE

The Edit mode allows you to edit all the paramenters relating to voice data, as well as function data. The 145 voice parameters are listed in Table 4-1 in the MIDI FORMAT section. The 25 function parameters are listed in the UTILITY chapter (Clear And Intialize All Functions section). However, for a detailed description of all parameters, consult the DX7 owner's manual.

Virtually all plarameters may be edited from a DX7; the only plarameters which must be edited on the fornt panel of the TX816 are Output Level Attenuation and Limit Highest/Lowest Note. The Edit mode is entered by holding down SW3. If the TX816 is in the Play mode, the next display shown on the LED Display will be the Edit mode shown above. When you see this display, release the SW3 key. It takes about one second to move from Play to Edit. SW3 selects the sub-modes within the Edit mode. These are as follows:

1. Select Program Number For Edit (press SW3 once)



This allows you to select for editing one of the 32 voices stored in the TF1's internal memory. The voice will be transferred from the memory to the Edit Buffer, where it is available for modifying. The voice and function data will be output from the MIDI OUT terminal on the front of the MIDI rack frame. so that connecting this to the MIDI IN of a DX7 as described in the SETTING UP chapter, copies all the data to the Edit Buffer of the DX7, where you can edit the voice as if it were one of the DX7's internal voices. The DX7 should be switched to SYS INFO AVAIL,its MIDI channel set to 1, and its Internal Memory Protect OFF.

SW1 and SW2 enable you to select the voice for editing. Pressing these keys will select the next higher-or lower-numbered voice, respectively. If you hold down one of these keys, the LED Display will to through the voice numbers rapidly, stopping when you release the key.

The LED Display example above shows that voice 32 has been selected for editing. The small dot in the lower right of the LED Display indicates that editing has commenced and at least one parameter in the voice has been changed.

NOTE:

> You can also select a voice number for editing, using, a DX7, provided it is in the SYS INFO UNAVAIL mode. Simply press INTERNAL MEMORY SELECT on the DX7 and press the desired voice selector key. The LED Display will show the voice number you have selected. This can be much quicker than using the TF1 front panes switches. You will have to then switch the DX7 to SYS INFO AVAIL for editing.

If you select a voice with the DX7 in SYS INFO AVAIL, it will send the data of its own internal voice (or a cartridge voice, if you selected Cartridge Memory on the

DX7) to TF1's Edit Buffer, so that you can play or edit this voice and store it in the TF1 memory of you wish. When this happens (you perss a voice select key on the DX7) the LED Display will switch to [CU] (Current Voice) indicating that the TF1 has received a new voice. If you do not wish to edit this voice, press SW3 to reset the LED Display. (The data transmitted from the DX7 will still remain in the Edit Buffer, however, and will not be deleted until another voice is selected for editing. The Led display will again show [PC]↔[32]

How to Edit Voices With a DX7

While editing a voice in the TX816, the module that is being edited must be in the progarm change sub-mode, and it should be switched to "COMMON", with the basic system previously described. the modules that you do not wish to edit should be switched to "INDIVIDUAL" so that they do not produce any sound when the DX7 is played. However, if you wish to edit any other modules at the same time, they should be in the "COMMON" mode. The DX7 should be switched to SYS INFO AVAIL, its MIDI channes set to 1 and its Internal Memory Protect OFF. The voice and function data in the TF1's Edit Buffer will then be transmitted to the DX7's Edit Buffer.

You may now edit any parameter or function of your selected voice, using the data entry lever on the DX7. Every time you enter new data, or press a Function or Edit parameter key on the DX7, the data relating to that key will be immediately transmitted to the TF1, so that the contents of their respective Edit Buffers always remains the same. Every time a change in data is made on the DX7, no matter how small, the green Parameter Change LED on the TF1 will flash, to show you that the data has been received. In addition, as soon as the first data change is made, a small red dot will appear in the lower right okf the LED Display.

Data produced by a DX7 EG COPY operation can not be sent to the TX816. In this case the copied data must be stored in the DX'7s internal memory. After the data has been stored pressing the TX816, thus the TF1 voice will be the same as the DX7 voice.

It is not possible to use the DX7 DATA ENTRY control to edit the DX7 MW, FC, BC and AT ASSIGN ON/OFF parameters in the TF1 modules. The +1 and −1 buttons can be used.

Once you have completed editing of your voice, the net step it to store it in the TF1's internal memory, and this is explained in the STORE MODE chapter. If you do not store the new data, the voice will only stay in its edited form while it is in the Edit Buffer. In practical terms, this means that if you return to the Play mode, then switch to another voice, the edited voice will be erased from the Edit Buffer, and replaced by the new voice you have selected. Then when you switch back to the voice you were editing, it will appear in its original unedited form.

NOTE:

It is possible to edit a voice when the TF1 is in the other mode. The only difference is that when you move the DX7's data entry lever to change the numerical value of any parameter, the TF1's parameter change LED will NOT flash (i.e. the new data has NOT been received). The data will only be sent when you press the parameter or function key corresponding to the parameter that you have just changed with the data entry lever. The green parameter change LED will then flash, indicating that the new data has been received. This reinforces the warning at the beginning of this section, to switch any modules that are not being edited, to "INDIVIDUAL", otherwise they will be edited too. (But eeited temporarily, because no deit is permanent until it is stored into the TF1's internal memory).

2. Attenuate Output Level (press SW3 twice)

FM generated voices have a vase range of timbres, and their overall levels may vary. If, for example, you wish to change voices during a composition, you may need to balance up the different voice levels. This is done by utilizing the Attenuate Output Level sub-mode. This allows you to adjust the output level of individual voices in approximately 5 dB steps. indicated by numbers from 0 to 7.

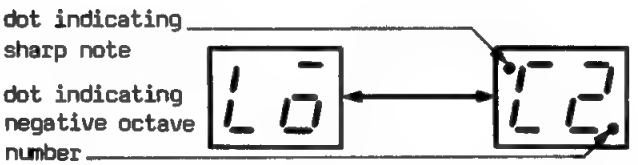
Pressing SW1 or SW2 raises or lowers the level respectively by one 5dB step at a time. Holding down either of these keys moves you rapidly through the attenuation settings.

The data entry lever of the DX7 may also be used to alter the attenuation setting.

The LED Display example above shows an Attenuate Output Level setting of 7.

This data change will not be permanent until it is stored into the TF1's internal memory. It is possible to store only function data, in as many "destinations" as you like. This means that you can rapidly set several different voices to the same output level (see STORE MODE chapter, Store Only Function section).

3. Limit Lowest Key (press SW3 three times)



As described in the SETTING UP chapter, it is possible to allocate a voice to any part of your keyboard, by selecting high and low note limits. All FM voices can be generated over a range of up to 127 semitones (over ten octabes), from C-2 (note C in octave -2) to G8 (note G in octave 8), depending on their frequency ratio setting. These correspond to MIDI note numbers 0 thru 127. The keyboard of a DX7 spans the 5 octave range "C1" to "C6", so it is easy to select note limits applying to this instrument.

This sub-mode lets you select hte lowest note of the range in which you wish to limit the voice.

This is simply done by using the SW1 and SW2 keys to select the required note, over the available range C-2 (C minus 2) to G8. The keys change the note one semitone at a time (up or down, respectively) when pressed, and when held down run rapidly up or down the scale. The Limit Highest Key and Limit Lowest Key functions are the only parameters that can NOT be edited from the DX7 keyboard.

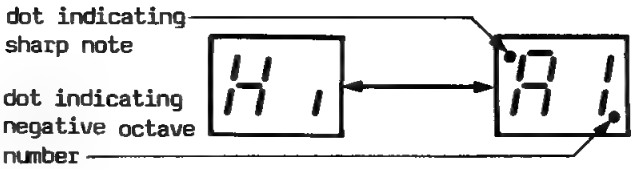
Negative octave numbers are indicated by a small dot in the lower right of the LED Display. Sharp notes are indicated by a small dot in the upper left of the LED Display. (There is no indicaiton for flat note--only the enharmonic shapr note is given, i.e. E flat = D sharp, B flat + A sharp, etc.)

The LED Display example above shows that the selected low key limit is C sharp in octave -2.

NOTE:

This data change is only permanent when stored into the TF1's internal memory.

4. Limit highest key (press SW3 four times)



This allows you to set highest note that the module will output for a particular voice. The range is the same as with the Limit Lowest Key: C-2 to G8, and is set in exactly the same way, using the SW1 and SW2 keys.

If you set the Highest Key limit lower than the Lowest Key limit, the voice would not be played at all-- a useful way of temporarily cancelling a voice without losing it from the momory.

The LED Display example above shows that the selected high key limit is A sharp in octave -1.

NOTE:

This data change is only permanent when stored into the TF1's internal memory.

The TX816's keyboard splitting facility is a highly creative musical tool, and investigation of its possibilities will prove rewarding.

For example, the keyborad split described in the Basic Operations section of the SETTING UP charter could be utilized to create a superb string orchestra sound, if you allocate the voices as follows:

Modules 1 & 2 Basses I & II
Modules 3 & 4 Cellos I & II
Modules 5 & 6 Violas I & II
Modules 7 & 8 Violins I & II

You can adjust these settings for different amounts of "overlap" of voices, and detuning modules (see Tune Master Pitch section in the PLAY MODE chapter) will create a richer, luch sound. with the TX216, you can create the impression of three different voices, by arranging th two voiced so that they overlap in the middle of the keyboard, to create a third voice. Transposing the voices toother octaves (using the KEY TRANSPOSE) feature on the DX7 will create different effects when the two voices are combined.

STORE MODE

No, the Store mode is not a fashion boutique. It's a simple means of gaining access to the internal memory of your TX816. Each TF1 module has a memory capable of storing 32 voices and 32 sets of function data. These can be thought of as being stored in pairs: voice data plus function data. Function data may also be stored separately. When you edit a voice in the TX816, the new data is created in the Edit Buffer, and is not permanent until it is stored in the internal memory. This is the principal function of this mode.

You can also use the Store mode for changing the order in which voices are arranged in the module's memory. For example, for easy voice changes during a performance, you could store all eight voices for one song in the number 1 program destinations of the eight voice modules; voices for another song in the number 2 destinations, and so on. A voice chart showing a possible arrangement of voices is given in this manual, together with a blank voice chart which you can copy for your own use.

The Store mode is entered by holding down Sw3. The LED Display will start to cycle through the four main modes, and the Store mode display shown above comes after the Edit mode display. When you see this display, release the SW3 key.

IMPORTANT:

You must switch OFF the Memory Protect function before entering any of the sub-modes within the Store mode. This is done by pressing SW2 after you see the store LED display. The Memory Protect LED should now not be lit. (Don't forget to turn the Memory Protect back ON after competing a store operation).

SW3 selects the sub-modes within the Store mode. These are as follows:

1. Select Destination (press SW3 once)

This allows you to select the destination for the data which you are storing. If you have created a new voice or new function data, you can choose any of the 32 program destinations in the memory in which to store it.

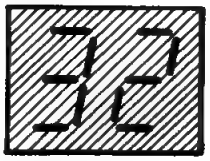
NOTE:

You may store both the voice and function data in the memory, or just the function data. If you store both voice and function data, any existing voice and function data in the program destination will be erased. However, if you store function data only, the voice data will remain in the memory, and the existing function data will be erased and replaced by the new function data created in the Edit Buffer.

SW1 and SW2 are used for selecting the destination number, from 1 to 32, with the usual "press for next number/hold down to run quickly through" action.

The LED Display example above shows that program destination 32 has been chosen for storage of the voice in the Edit Buffer.

2. Sotre Voice and Function (press SW3 twice)



Once you have selected the destination for your new data, pressing SW3 again sets the TX816 to the Store Voice and Function sub-mode, indicated by the destination number flashing rapidly, and you may now perform tow different operations:

(a) You can instantly store your newly edited voice, together with its function data, simply by pressing SW1 (which in this sub-mode acts as a "YES" key). When you do this, the Memory Protect LED, which should have been turned OFF as you are using the Store mode, will light for about a second indicating that storate is taking place. At the same time the LED Display will switch to [-] then return after the storage process to [32] and the module willl be returned to the Play mode.

Turn ON the Memory Protect at this time, by pressing SW2, so that your new voice is now securely stored.

(b) If you wish to store function data only, without affecting the voice data in your selected program destination, press SW2, which in this sub-mode acts as a "NO" key.

The LED Display will show the flashing destination number, this time alternating with a flashing "F", indicating that you are in the next sub-mode.

3. Store Only Function (Press SW3 twice then SW2 once)

When you see the above LED Display, you know that you can now store your function data in your selected program destination, without affecting the voice data stored there. However, you still have a chance to change your mind, by pressing SW2 (the "NO" key) which will return the module to the main Store mode. The LED will show [5F] .

At this point you can again select the Select Destination Sub-mode and select a different destination number, or move on to another mode.

If you do want to store the function data, press SW1 (the "YES" key). As with the previous sub-mode, the Memory Protect LED will light for about a second, showing that storage has taken place. The LED will switch to [-] during storage, thaen return to [5F] .
The TF1 has stayed in the Store mode to enable you to send the same function data to several different destinations. For example, you might wish to give several voices the same Pitch Bend, After Touch or Attenuste Output setting. You can quickly move from the Store mode to the Store Only Function sub-mode by pressing SW3 twice then SW2 once.

The function data will remain in the Edit Buffer until another voice is selectid for playback or edit.

Once you are back in the main Store mode, if you do not wish to store the function data in any other program destinations, don't forget to switch the Memory Protect ON again (press SW2).

UTILITY MODE

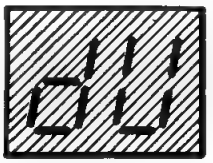
This mode contains a variety of useful functions not related to the creation of new data. These enable you to dump all program data, clear and initialize function data, activate an audio check signal, and check the battery level. The Utility mode is entered by holding down SW3 until you see the above LED Display, which follows the display.

NOTE:

If you intend to use the Clear Function sub-mode (number 3 below) you MUST first turn the Memory Protect OFF on the TF1 module, While it is in the main Utility mode.

SW3 selects the sub-modes within the Utility mode. These are as follows:

1. Dump All voices And Functions (press SW3 once)



This sub-mode allows you to dump the entire voice and function data in the memory of a module, out through the MIDI OUT terminal on the front of the MIDI rack frame. In practical terms, this means that you can quickly send all the data pertaining to the 32 voices and functions stored in the memory, to the memory of another TF1 module for playback or editing, or into the internal memory of a DX7. With the DX7, only voice data will be received, not function data. In this sub- mode you can also dump the voice data of all the TF1's 32 voices onto the floppy disk of a QX1. (The QX1's Operations Directory explains how you can also dump function data into a QX1, without utilizing this sub-mode).

Dumpling does not mean that the data is removed from the TF1's memory; it is, in effect, copied into the new source. Data is erased from the memory of a TF1 only when new data is stored into it.

NOTE:

to dump data from a module, you must select the module number on the OUT SLOT on the front of the MIDI rack frame. Pressing the OUT SLOT SELECT switch adds one to the number displayed, until you see the desired number (from 1 to 8).

In this sub-mode the SE2 switch acts as a "YES" key, allowing you to dump data in about 4 seconds. During this process, the LED Display will switch to .

It will then switch back to .

You can now dump data into another MIDI device, move on to another Utility sub-mode by pressing SW3, or move on to another main mode by holding down SW3.

If you do not wich to dump, press SW1 (the "NO" key) and the TF1 will switch to the next sub-mode.

- ***DUMPING DATA INTO A DX7***

Using the Basic system decribed in the SETTING UP chapter, you can dump voice data (not function data, in this case) into the DX7's internal memory, as follows:

(a) Set the DX7 as follows: SYS INFO AVAIL, INTERNAL MEMORY PROTECT OFF, and the MIDI channel set to 1. (The TF1 always transmits data via MIDI channel 1.)

(b) Select the Dump All Voices And Functions sub-mode, as descrebed above (remembering to select the OUT SLOT corresponding to the module you are dumping from) then press SW1. After the 3 second dump process, the LCD display on the DX7 will show "MIDI RECEIVED" regardless of its previous setting.

If it shows "MIDI DATA ERROR!" there has been an error in the setting of the DX7 and you should follow the above procedure once again.

- ***DUMPING DATA INTO ANOTHER TF1***

This procedure may be carried out with the TX816 on its own——no other equipment is required. Let's assume you want to dump voice data from module 1 to module 2.

(a) Connect the MIDI OUT on the front of the MIDI rack frame to the MIDI IN on the rear of module 2.

(b) Switch module 2 to "INDIVIDUAL" and turn its Memory Protect OFF. Set RECEIVE BASIC CHANNEL to 1. This module can be in any mode, or even sub-mode—— this will not affect the dumping procedure.

(c) Set module 1 to the Dump All Voices And Functions sub-mode, and carry out the dump operation as described at the beginning of this section.

While dumping is in prograss, the Memory Prdotect light on module 2 will light.

Halfway through dumping, the LED Display on module 2 will quickly flash to  (All Voices) showing that the voice data of all 32 voices in module 1 has been received. It will then return to its original display.

When dumping has been completed, Module 2's LED Display will show  (All Functions) indicating that all the function data for the 32 voices in module 1 have been received.

(d) Reset module 2 to its original mode or sub-mode by pressing SW1, SW2 or SW3.

(e) The voice and function data of all 32 voices in module 1 will now be loaded into module 2. Do not forget to switch module 2's Memory Protect back on again!

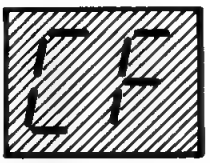
- ***DUMPING DATA INTO A QX1***

The MIDI system really does make it easy to deal with complex data and highly sophisticated digital music devices. Dumping data into a QX1 Digital Sequence Recorder is a very simple process. The TX816 and ZX1 use System Exclusive Information to carry out the dumping process. This is detailed in the QX1 Operations Directory, and does not in fact require that the TX816 be switched to the Cump All Voices and Functions sub-mode.

With the QX1, you can save the complete data for up to 8 sets of 32 FM voices

(in other words, all the voices stored in a TX816) on one light, inexpensive floppy disk--an easy, inexpensive way to build a library of FM voices. And with this method function data can also be stored, for a domplete record of your voices.

2. Clear And Initialize All Functions (Press SW3 twice)



This sub-mode allows you to clear all the function data in a memory, and initialize these functions to their original factory setting. This is particularly useful if you wish to reset all the functions in the memory prior to creating new function data in the Edit mode.

For example, you may have a selection of orchestral voices in your TF1, and would like to give them all a specific Breath Control effect to replace the portamento effect you have already programmed into them. Without this Clear Function feature, you would have to store into each voice a "zero portamento" setting, to cancel the portamento effect, as well as storing the Breath Control data. With the Clear Function, you can first initialize all functions and then rapidly store the desired Breath Control data into each voice, using the Store Only Function sub- mode.

NOTE:

Any function data held in the Edit Buffer will not be cleared by this process.

In this sub-mode, the SW1 and SW2 keys act as "YES" and "NO" buttons respectively.

IMPORTANT:

for the Clear And Initialize All Functions sub-mode to operate, you must have first furned the Memory Protect to OFF while in the main Utility mode.

The Clear Function sub-mode is enterd by eithe pressing SW3 twice when you are in the main Utility mode, or by pressing either SW2 or SW3 when you are in the previous sub-mode (Dump All Voices and Functions).
To Clear and Initialize All Functions, press SW1 (the "YES" key).

During the two-second clearing prodess, the Memory Protect LED will light, and the LED Display will switch to [ ]

The LED Display will then return to [ ] Press SW3 to move to the next sub-mode, or hold down sW3 to move to the next main mode.
If you press SW2 (the "NO" key) indicating that you do not wish to Clear Functions, the LED Display will switch to the next mode.
The function settings for all voices in the memory are initialized to the following values:

Function		Setting	Function		Setting
Poly/Mono		Poly	Breach Control	Range	15(99)
Pitch Bend Range		7		Pitch	off
Pitch Bend Step		0		Amplitude	off
Portament Mode		Sustain		EG Bias	off
		Key Follow	After Touch	Range	8 (53)
Glissando		off		Pitch	off
Portamento Time		0		Amplitude	off
Modulation Wheel	Range	8(53)		EG Bias	off
	Pitch	on	*Audio Out put Level Attenuator		7
	Amplitude	off			
	EG Bias	off	*Note limit Low		C-2
Foot Control	Range	8(53)	*Note limit High		G8
	Pitch	off			
	Amplitude	off			
	EG Bias	off			

* Bracketted values in this chart apply only to a DX7 or DX9.

* Functions marked with an asterisk are not included in a DX7 or DX9 – these are functions set using the keys on the TF1 itself, in the Edit mode.

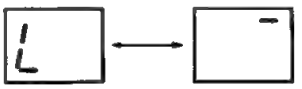
3. Audio Check (press SW3 three times)

The Audio Check sub-mode, as mentioned in the SETTING UP chapter, gives you an audio check signal from the audio output of a module. This is a standard 440 Hz sine tone at -4 dBm, and is useful for setting input sensitivity levels in your mixing console, or levels on your tape deck or whatever equipment the module is connected to. It also offers a simple way of chacking connections and ensuring that the module is functioning, as well as an accurate concert-pitch tone by which to tune other instruments.

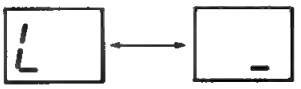
When the Audio Check Signal is ON,you will not be able to play the voice selected on your module. Any notes played will be a pure sine wave.

The SW1 and SW2 keys act as ON and OFF switches respectively.

When the Audio Check is On, the LED Display shows



When the Audio check is OFF, the LED Display shows



To leave the Audio Check sub-mode, press SW3, which will switch the module to the next sub-mode.

4. Read out Current Voltage Of Battery (press SW3 four times)

The memory of each module in the TX816 is backed up by a Lithium battery, so that all voices are protected when the power is turned off, and in the case of power failures. The life of this battery is about five years, and the TF1 is fitted with this simple battery check device so that you can at anytime check the contition of your battery. The battery level is multiplied by a factor of 10 on the LED Display. For example, the above LED Display shows a battery level of 3.5 volts, indicated by the number 35.

To leave this sub-mode, press SW2 or SW3, and the TF1 will return to the main Utility mode. SW1 does not function in this sub-mode.

IMPORTANT:

Once the battery level is 2.2 volts or less, the battery will need replacing. Contact the store where you purchased your TX816 as soon as possible.

NOTE:

When the battery is removed, all data stored in the memory will be lost. Be sure to make a note of any important parameters before the battery is removed, so that you can input them again later. Better still, save all the voice and function data on a RAM cartridge or floppy disk (as described in the Dump section in this chapter) and load it back into the TF1 after a new battery is installed.

SYSTEM EXAMPLES

The TX816 is an enormously potent digital music device. Using it as the center of a complex system, or simply controlling it with a single MIDI keyboard, you will discover many new ways of using its sophisticated features. We offer these system examples as indications of the TX816's vast potential, which will expand as more MIDI devices become available.

NOTE:

If a MIDI device is connected to the TX816's COMMON MIDI IN, the modules must be switched to "COMMON, if it is connected a TF1's INDIVIDUAL MIDI IN, that module must be switcahed to "INDIVIDUAL".

THE BASIC SYSTEM: FURTHER OPTIONS

1. The Basic System (see the SETTING UP chapter) is ideal for editing and controlling the TX816 with a DX7. With the DX7 in the SYS INFO UNAVAIL mode, it can be used to change the voices in the TX816 (e.g.,selecting DX7 voice 23 will call up voice 23 form the internal memory of the tX816). However, with the DX7 in SYS INFO AVAIL it will send its own voice data to the TX816 Edit Buffer, and the LED Display will show [CU] (Current Voice). In this way, you have 32 more voices available. In fact, you can have unlimited voices stored in RAM cartridges, and "play" them through the TX816 by pressing CARTRIDGE MEMORY prior to selecting a voice.
2. You can load all the voice data of a DX7 into a TF1 as follows (we'll assume you want to load into module 1 only).

(a) Press SW1 to switch module 1 to "COMMON". Then press SW2 to switch OFF its Memory Protect. Turn ON the Memory Protects of modules 2 thru 8, or they will also receive the DX7 voice data.

(b) Set the DX7 to SYS INFO AVAIL. Transmit the voice data by selecting MIDI TRANSMIT? and pressing the YES/ON key.

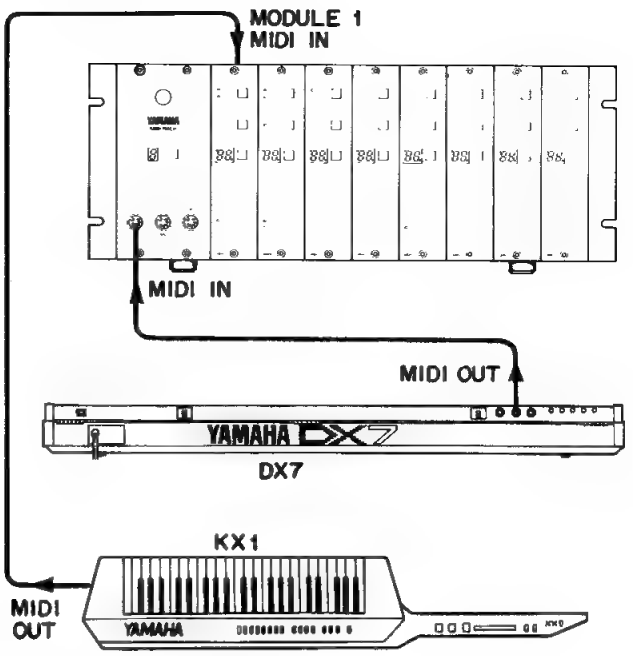
(c) During loading, module 1's Memory Protect Led will light. The Led Display will then show [AU] All 32 DX7 voices are now in musule 1's internal memory. Press SW3 to reset the LED Display and SW2 to turn ON the Memory Protect.

(d) Set the DX7 to SYS INFO UNAVAIL. As you select voices on the DX7, the new voices will be selected in module 1.

NOTE:

You can load DX7 voice data into any number of TF1's simultaneously, by switching modules to "COMMON" and turning their Memory Protect OFF before loading.

System 1: TX816 plus DX7 plus KX1

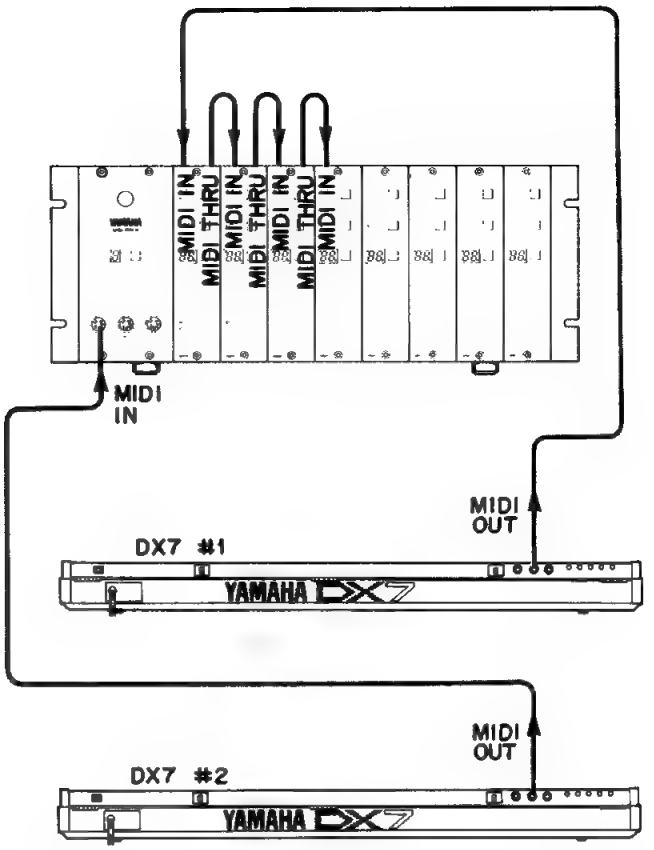


This system is ideal for the key board artist who sometimes likes to get out front with the quitarists. The DX7 is connected to the COMMON MIDI IN terminal on the front of the MIDI rack frame. The KX1 remote keyborad is connected to the INDIVIDUAL MIDI IN terminal on the rear of module 1.

With this system, you can play modules 2 thru 7 from the DX7 and when you feel like going out front for a solo, you can pick up the KX1 and use it to play module 1.

While playing the DX7, you could switch module 1 to COMMON so that it is controlled by the DX7 along with the other 7 modules. You would then have to remember to switch it back to INDIVIDUAL before playing the KX1.

• *A VARIATION ON SYSTEM 1 : TX816 PULS 2 DXS*



This is also a TX816-plus-two-keyborad setup, and is suitable for the keyboardist who wishes to play 2 DXs, perhaps as part of two different keyboard stacks. With this variation you merely add 3 more MODI cables connected as follows (all connections made on the rear panels of the modules):

Module 1 MIDI THRU to module 2 MIDI IN
Module 2 MIDI THRU to module 3 MIDI IN
Module 3 MIDI THRU to module 4 MIDI IN

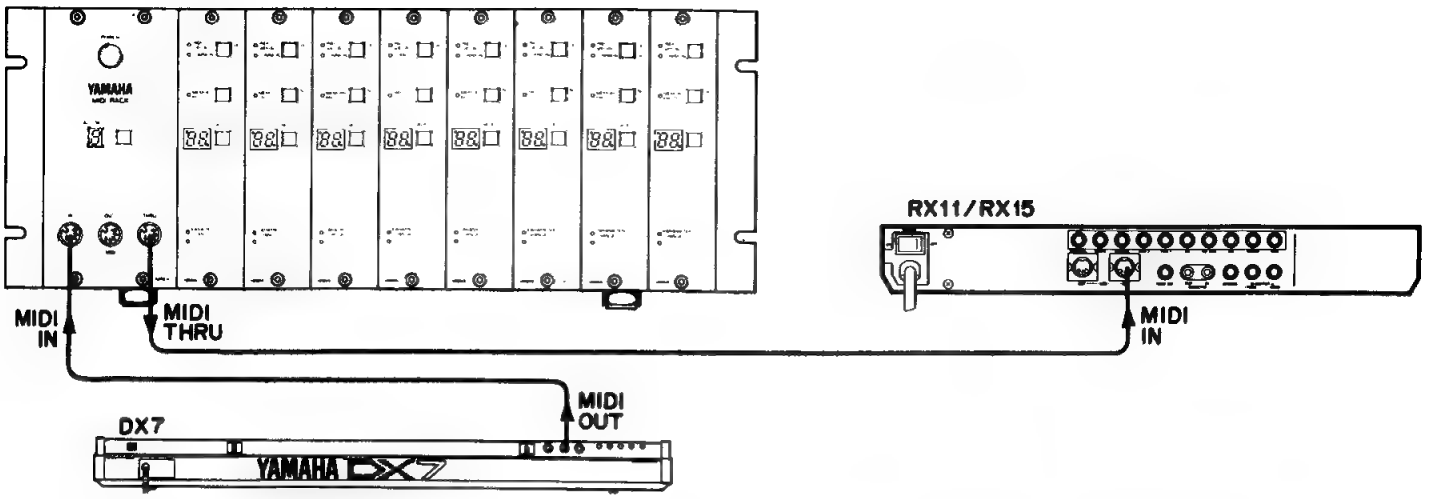
Modules 1 to 4 are switched to INDIVIDUAL. The MIDI OUT terminals of DX7 no.1 and DX7 no.2 are connected to module 1's INDIVIDUAL MIDI IN and the COMMON MIDI IN respectively. The MIDI control signal from DX7 no.1 controls module 1, and is also passed THRU to control module 2, from where it is passed THRU to control module 3, from where it is passed THRU to control module 4.

In this way DAX7 no.1 palys modules 1 thru 4. while DX7 no.2 plays modules 5 thru 8. You can of course, choose different numbers of modules to be controlled by each keyborad. You could, in fact, "daisy chain" all eight modules together in the same manner as we just connected modules 1 thru 4. Then switching all eight modules to INDIVIDUAL allows them all to be controlled by DX7 no.1 and switching them to COMMON allow them to be controlled by DX7 no.2. If you did choose to use a KX1 instead of one of the DX7's, this would mean that you could control the total power of the TX816 while sitting at a "conventional" keyborad, or while leaping around the stage with the lightweight KX1 remote keyboard!

It is also easy to control the TX816 with even more than two keyborads, by connecting them to the INDIVIDUAL MIDI IN terminals on the rear panesl of the

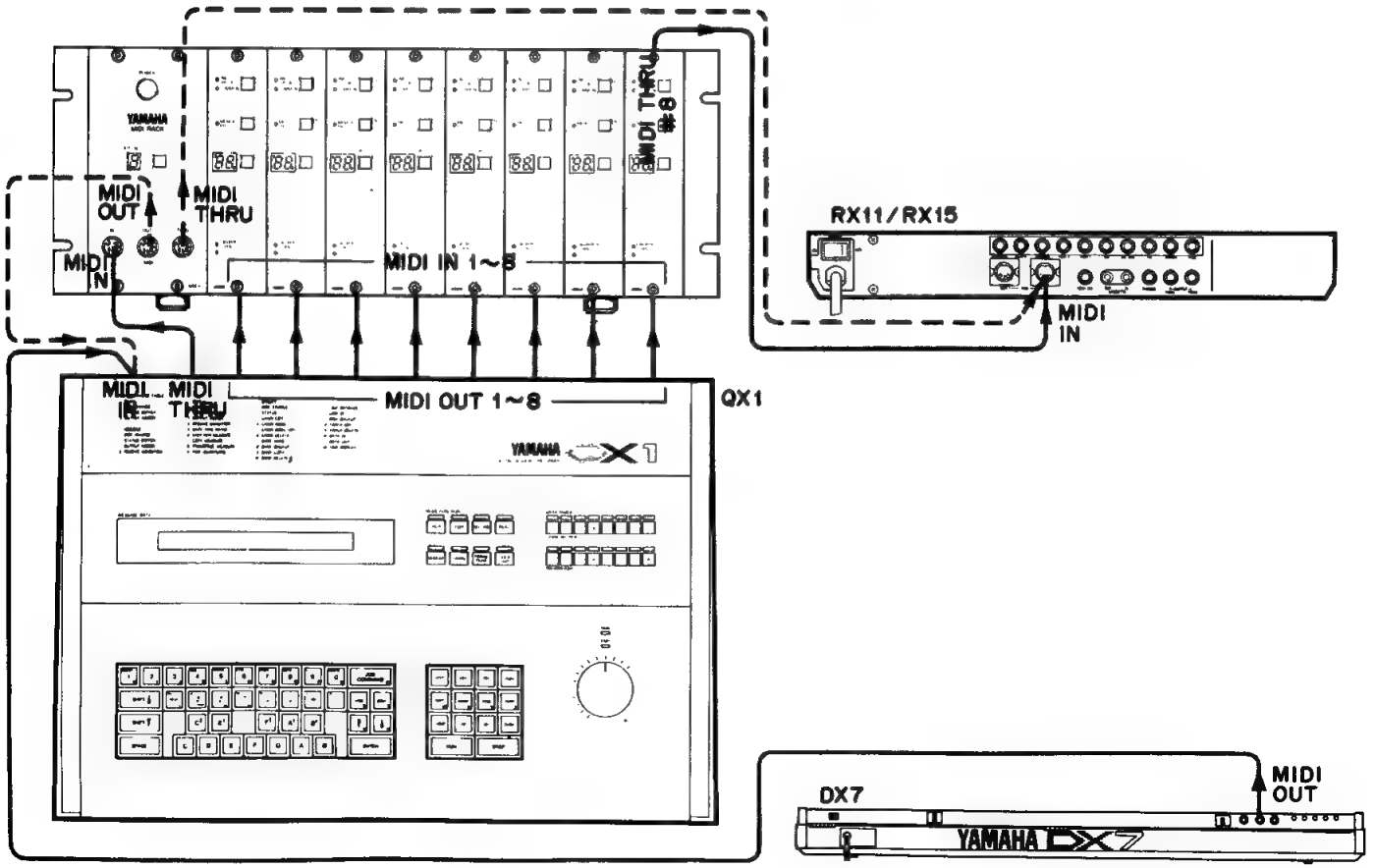
modules, and daisy-chaining modules together so that the eight modules are "shared" between the keyboards in any configuration you choose.

System 2 : TX816 plus DX7 plus RX11/RX15



MIDI compatibility enables you to play the digital drum sounds of the RX11 or RX15 Digital Rhythm Programmer from a DX7. The individual drum sounds may be allocated to any note on the DX7 keyboard. This simple system allows you to add these powerful percussion voices to the enormous tones of the TX816, for truly impressive results. The MIDI THRU terminal on the fornt of the TX816 allows the MIDI signals from the DX7 to be passed to the RX11/RX15.

System 3 : TX816 plus DX7 plus QX1 plus RX11/RX15



This is a truly powerful system. Performances on the DX7 are memorized on the

QX1 Digital Sequence Recorder, which can store up to 80,000 notes (about an album's worth) on eight tracks, with virtually unlimited overdubbing. The QX1 then transmits this data to the TX816, with each of the eight tracks of data driving one of the TF1 modules in the TX816. The MIDI THRU terminal of TF1 module 6 is connected to the RX11/RX15 allowing it to be driven by the MIDI clock signal transmitted from MIDI output 8 of the QX1. What's more, as with any of the systems in this chapter, you can use the audio output of the DX7 to add an extra voice to the numerous voices already at your disposal.

The TX816 will follow any voice changes programmed into the QX1. It would thus be an extremely simple matter to utilize all 256 voices in the TX816, in a single highly sophisticated composition. Also, the RX11/RX15 Digital Rhythm Prdogrammer will follow any tempo changes programmed into the QX1, adding increadibly realistic drum sounds to the most complex composition.

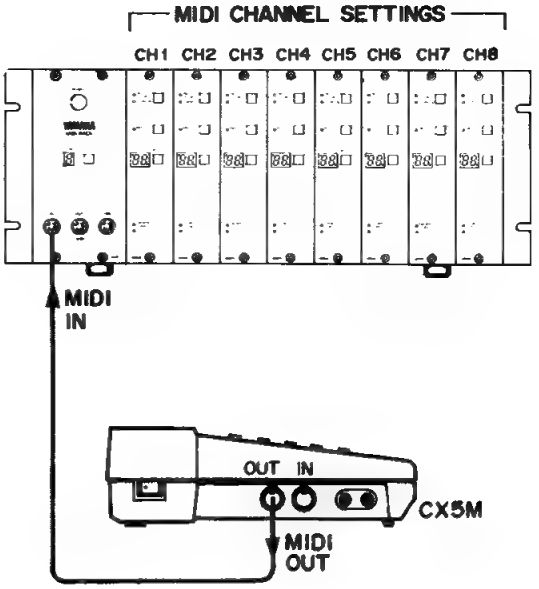
Not only can all the music data be stored on the QX1's floppy disk; you can also save all the voice and funciton data from each TF1 module onto the Floppy disk, by connecting up the TX816 MIDI OUT to the QX1 MIDI IN. See the Dump All voices And Functions Section in The Utility MODE Chapter, and your QX1 owner's manual, for details of this procedure.

Finally, the MIDI THRU output of the QX1 passes MIDI signals from the DX7 to the TX816, so that you can play the TX816 directly, merely by switching all the TF1 modules from "Individual" to "Common" Connecting the COMMON THRU output of the TX816 to the RX11/RX15 passes the DX7 MIDI signal on once again to directly control the RX11/RX15. There is, in fact, no limit to how many times you can pass a MIDI signal IN to an instrument and THRU to another one. In this way, whole chains of MIDI devices can easily be controlled by a single MIDI keyboard.

System 4 : TX816 plus CX5M

The Yamaha CX5M Music Computer is a hignly sophisticated yet easy to use digital programming device which, for a very moduest outlay, permits you to produce truly orchestral-sounding music with your TX816. It is, of course, MIDI compatible, and its enormous range of functions depend on which software you use with it. Particularly suitable, when using the CX5M with the TX816, are the YRM-101 FM Music Composer Program and the YRM-103 DX7 Voicing Program. These require slightly different setups, so we will descrebe them separately.

• *THE MUSIC COMPOSER SYSTEM*



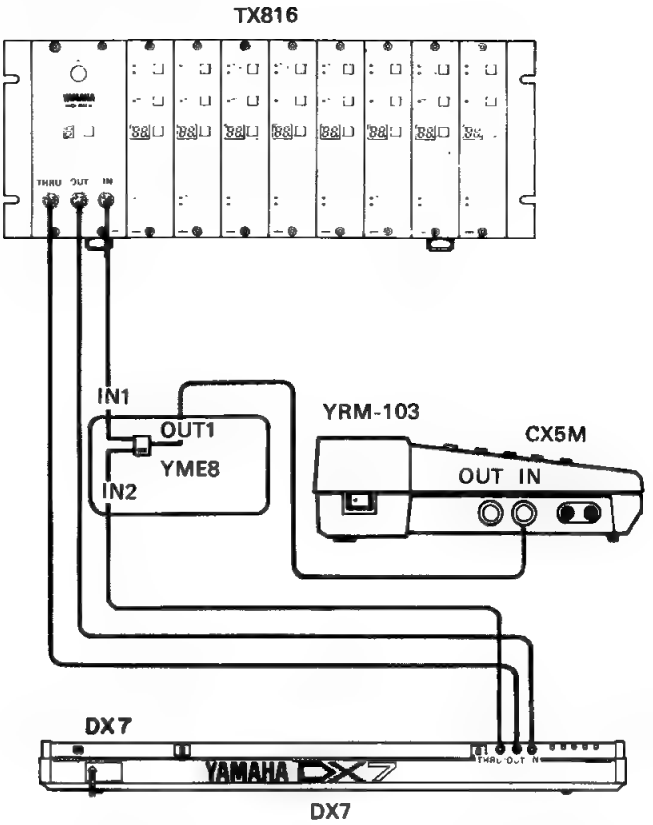
The Music Composer Program enables you to actually compose music in the CX5M, by entering data for individual notes, voice changes, tempo changes, dynamics, and so on. The music can be composed in up to eight monophonic parts (or smaller number of polyphonic parts, as long as no more than 8 notes are played simultaneously). But the CX5M has only one MIDI output--how can each of the eitht parts be played on a separate TF1 module? The solution is simple...

The Music Composer owner's manual givesj full instructions on how to insert MIDI channel numbers into the program. With a composition scored for eight parts, the obvious course is to insert a MIDI channel number at the beginning of each part (mathcing the parts numbers, 1 thru 8), and switch the corresponding TF1 modules to receive MIDI data on the same channel, using the Set Receive Basic Channel sub- mode.

The CX5M can then act as a sequencer to control the TX816, instead of using its own built-in FM Tone Generator Module to create sounds. The FM voices on the TX816 are each created by six operators and give much richer tones than the 4-operator voices in the CX5M, so your FM Music compositions will be greatly enhached. You also have a total choice of 256 voices in the TX816, as opposed to only 46 in the CX5M. You can allocate each of the eight parts to a different MIDI channel, and insert MIDI commands to change the voices on the TX816 at any point in the score.

Connect the MIDI OUT of the CX5M to the COMMON MIDI IN of the TX816. The MIDI data for all eight channels will be sent down a single MIDI cable, when you play your programmed composition into the TX816. You can, of course, insert further MIDI commands into your Music Program if you want a parts to be played on a different module, or several parts to be played on one module (in this case one or more modules would then be free to be controlled by a DX7, so that you could "play along" with the music program).

• *THE DX7 VOICING SYSTEM*



(a) Connect the components as shown in the above diagram. Set the YME8 switch to the "MIDI IN 2" position. If a YME8 is not available then the CX5M MIDI IN terminal should be connected to the DX7 MIDI THRU terminal.

(b) Press the CX5M [F1] key to enter the "Voice Edit" mode.

(c) Set the DX7 INTERNAL MEMORY PROTECT to OFF, MIDI CH to 1, and SYS INFO to AVAIL.

(d) Set the MIDI IN of the TF1 module in which editing is to take place to COMMON, and all othe modules to INDIVIDUAL. Set OUT SLOT to the number of the module to be edited.

(e) Set the TF1 module to the SELECT PROGRAM NUMBER FOR EDITING sub-mode, and select the voice number to be edited using SW1 or SW2. This causes the bulk data of the selected voice to be sent to the DX7 and CX5M (see NOTE, below). Now the TF1, DX7 and CX5M edit buffers all contain the same data.

(f) Set the YME8 switch to "MIDI IN 1". If a YME is not being used, remove the dx7 THRU connection and connect it to the TX816 THRU terminal.

(g) Use the DX7 to edit the voice. All parameters and data will be graphically displaed on the CX5M monitor screen.

(h) Once editing is completed, use the TF1 store mode to store the edited data.

NOTE:

The transmitted function bulk data can be received by the DX7, but not by the CX5m. To display the functionm data on the video monitor screen, in step (g) the DX7 must be set to the FUNCTION mode and buttons 2—7 and 17—32 all pressed in sequence.

It is possible, with the DX7 Voicing Program, to transmit voice data between the TX816 and the CX5M. No DX7 is reguired.

Connect the MIDI OUT of the CX5M to the COMMON MIDI IN of the TX816.

Connect the MIDI IN of the CX5M to the COMMON MIDI OUT OF THE TX816.

Select the number of the module you are working with, using the OUT SLOT selector key.

We'll now describe four operations that are possible with this setup.

(i) Using the CX5M to Check TF1 Voice Parameters

(a) Press [F1] on the CX5M to select the Edit Mode.

(b) On the TX816, call up the Select Program Number For Edit sub-mode. Assign the module you are working with to the COMMON MIDI OUT terminal, by pressing the OUT SLOT selector key until the module number appears on the OUT SLOT LED.

(c) When you Press SW1 or SW2 to select a voice on the TF1, the parameters for that voice will be displayed on the video monitor.

NOTE:

The DX7 Voicing Program was not designed to be used with the TX816, so the differents in formatting means that you can check only voice data in this way, not funcitons data.

(ii) Loading the Data of One Voice From the CX5M to a TF1

(a) Switch the TF1 to COMMON. It can be in any mode -- the Edit mode is not necessary for this operation.

(b) Press [F5] on the CX5M, to select the PLAY function. Then type in the number of the voice you wish to send, and hit RETURN. The green parameter Change LED will flash once on the TF1, and the LED Display will show  , indicating that a voice has been received. The voice data and function data will now be in the Edit Buffer of the TF1, available for playing, editing, or storing.

(iii) Loading a Set of 32 Voices From the CX5M to a TF1

(a) Turn the TF1 Memory Protect OFF.

(b) Press the [F7] key on the CX5M (this is done by pressing [SHIFT] plus the [F2] key). You will now see the "Midi Ch=" display on the screen. If the MIDI channel is already the same as the one used by the TF1, go on to paragraph (d). If not, go on to the next paragraph.

(c) Type in the MIDI channel number corresponding to the one the TF1 is using, and press [RETURN]. Then press [F7] again.

(d) Press the [SELECT] key twice to get the "MIDI Tfr to DX7?" display.

(e) Press the [DEL] key to get the "Are You Sure?" display, then press the same

key again to load the voice data. During the loading process, the TF1's Memory Protect LED will light up for about 2

seconds,after which the LED Display will show [AU],indicating that it has received the 32 voices form the CX5M.

NOTE:

Function data cannot be transferred to the TF1 this operation-- it can only be transferred when losaing one voice at a time as descrebed in the previous operation.

(iv) Loading a Set of 32 Voices Frum a TF1 to the CX5M

(a) Call up the Select Program Number For Edit sub-mode on the TF1, and press SW1 to select program 32. Assign the module you are working with to the COMMON MIDI OUT terminal, by pressing the OUT SLOT selector key until the module number appears on the OUT SLOT LED.

(b) Switch the CX5M to the Directory display (press [F1]), then press [F7] and [SELECT] to get the "MIDI Tfr from DX7?" display. Then press [DEL] and get the "Are You Sure?" display.

(c) Press [DEL] again, and WITHIN THREE SECONDS start to press sw1 on the TF1. You must press it three times at roughly one- secont intervals. If you are too late, the screen will revert to the Directory display and you mast go back to paragraph (b).

(d) Within about three seconds, hold down SW2 on the TF1. You will find that as the program number LED Display on the TF1 runs forn 32 down to 1 the voices appear in the CX5M directory, one at a time.

Funciton data will not be sent.

SPECIFICATIONS

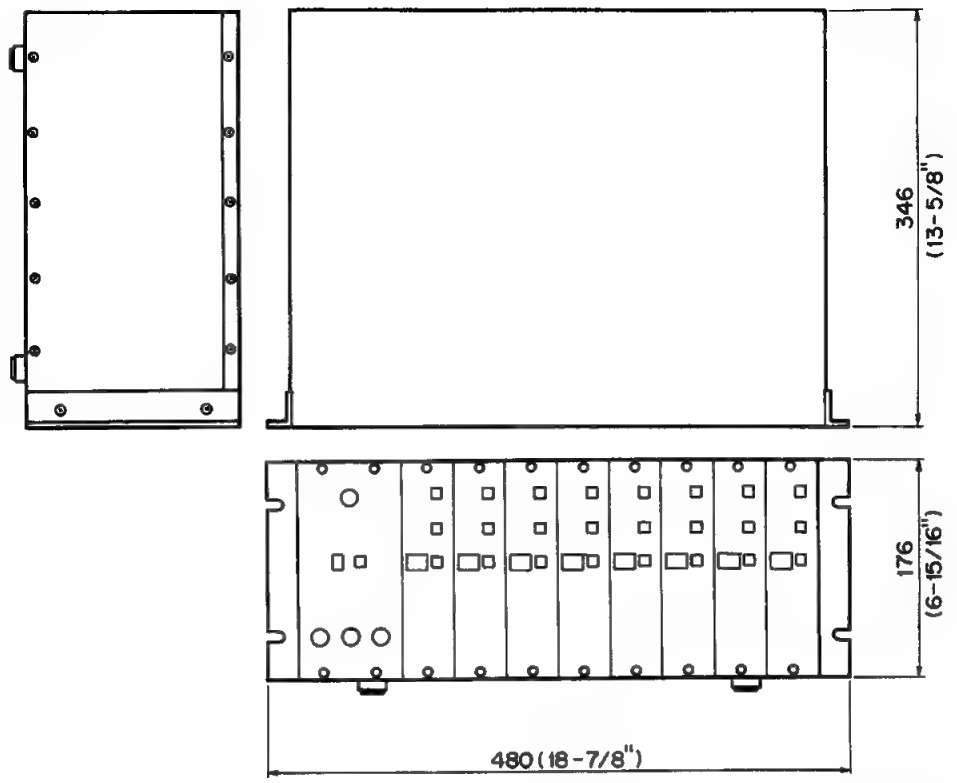
	TX216	TX816
CONFIGURATION	MIDI RACK FRAME TF1 FM Tone Generator X 2	MIDI RACK FRAME TF1 FM Tone Generator X 8
POWER REQUIREMENTS (U.S./Canadian models) (General model)	 120 V (60 Hz) 100~120/220~ V (50/60Hz)	 120 V (60 Hz) 100~ 120/220~240 V (50/60Hz)
POWER CONSUMPTION	22W	70W
DIMENSIONS (W X H X D)	480 X 176 X 346 mm (18-7/8"X6-15/16"X13-5/8")	480 X 176 X 346 mm (18-7 /8"X6-15/16"X13-5/8")
WEIGHT	10kg (22 lbs.)	12 kg (26 lbs. 6oz.)
STANDARD ACCESSORIES	MIDI cable [1.5m (5 ft.)x2] MIDI cable [5m(16.4 ft.)] Socket wrench	MIDI cable [1.5 m (5 ft.)x8] MIDI cable [5m(16.4 ft.)] Socket wrench

MIDI RACK FRAME	
TERMINALS	MIDI IN, MIDI OUT, MIDI THRU (5-pin DIN)
CONTROLS	Power ON/OFF, MIDI Out Slot select
MASTER CLOCK RATES	9.4265 MHz
DIMENSIONS (W X H X D)	486 X 176 X 346 mm (19-1/8"X6-15/16"X13-5/8")
WEIGHT	8 kg (17 lbs. 10 oz.)

TF1	
SOUND SOURCE	FM Tone Generator (6 Operators)
SIMULTANEOUS NOTES OUTPUT	Polyphonic-16 (first note priority) Monophonic-1 (last note priority)
INTERNAL MEMORY	32 program (32 voice +32 function)
PANEL CONTROLS	Individual/ Common or YES/+1 Memory Protect ON/OFF or No.-1 Mode Select
LEDS	Individual; Common;Memory Protect; Parameter Change:Error
NUMERIC LED DISPLAY	Program number, numeric data, etc.
TERMINALS	MIDI IN, MIDI THRU (5-pin DIN) Line Out (XLB-3-32 type)
OUTPUT LEVEL	-10 dBm, 600ohms
DIMENSIONS (W x H x D)	480 X 176 X 346 mm (18-7/8" X 6-15/16"X13-5/8")
WEIGHT	600 g (1 lbs. 5 oz.)
STANDARD ACCESSORIES	MIDI Cable [1.5 m(5 ft.)] Socket wrench

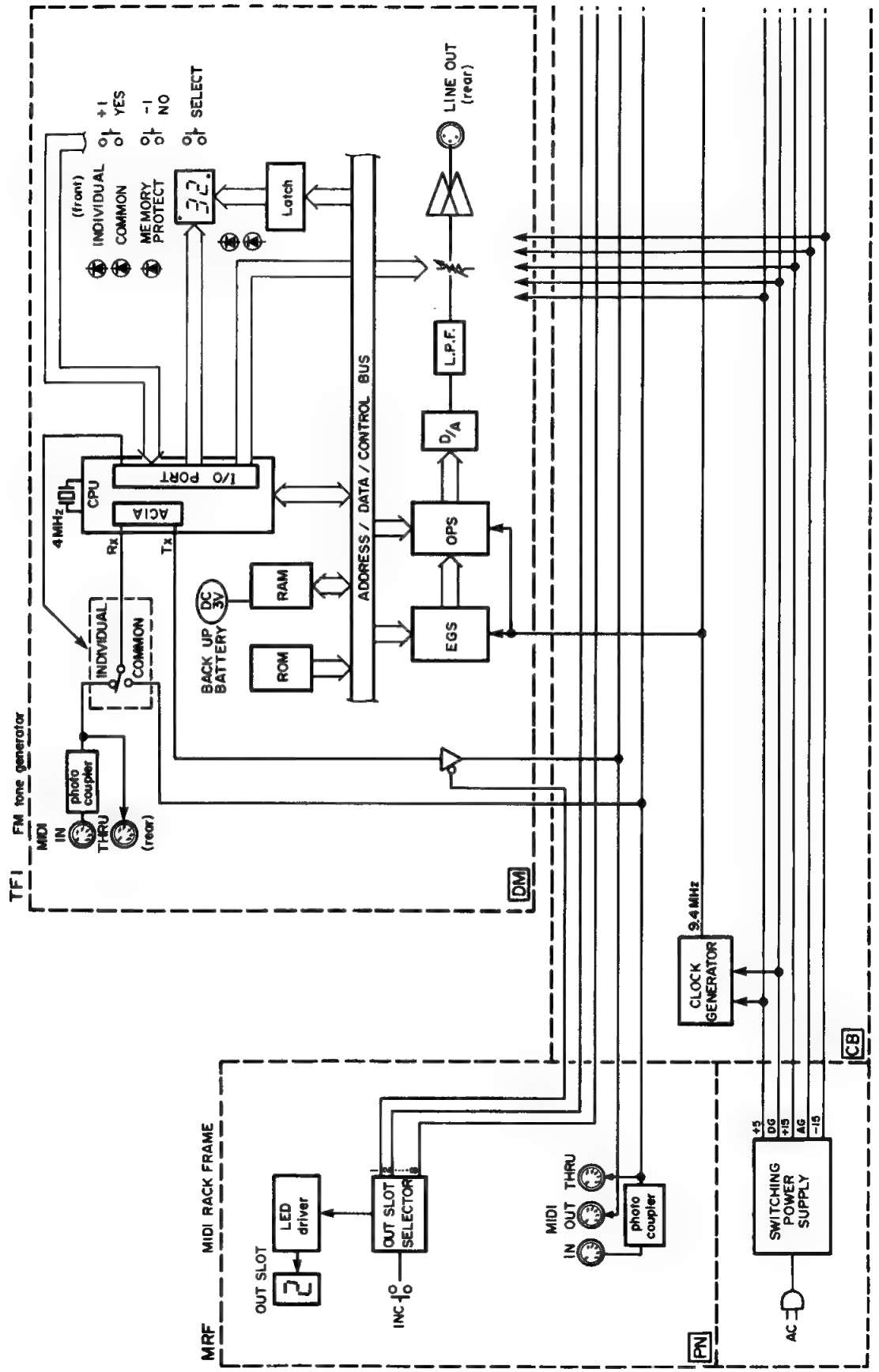
All specifications are subject to change without noice.

DIMENSIONS:



Unit : mm (inch)

BLOCK DIAGRAM



HOW THE MIDI SYSTEM WORKS

MIDI stand for Musical Instrument Digital Interface. It is an internationally accepted standard for signal communications between digital music divices. More and more major manufacturers are adopting the MIDI system, and although MIDI instruments made by different manufacturers are not always totally compatible, they should at least be able to play each other and seitch each other's voices.

The MIDI system is what makes it possible to connect all Yamaha's digital instruments together easily and quickly, to form enormously powerful digital music systems. And it is all based on a very simple fact:

Any number can be expressed by a combination of 1s and 0s.

This is also the basis for the entire computer industry, and is easily explained as follows:

We normally express numbers using the decimal system, which has ten different digits (including zero). An alternative way of expressing a number is the binary system, which used only two dights:
1 and 0. The decimal system expresses numbers as powers of ten (one, ten, a hundred, a thousand, etc.) and the binary system expresses numbers as powers of two (one, two, fokur, eight, etc.). Here are some decimal numbers and their equivalents in the binary system.

0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
10	1010
16	10000
32	100000
64	1000000
100	1100100
127	1111111
255	1111111

From this, it dit not take a great quantum leap in thinking for an unknown engineer to figure out that this meant that any number could be transmitted by merely switching on and off an electronic pulse signal. The presende of a signal would indicate a 1, and the absence of a signal would indicate a 0, and this is exactly how MIDI words. Any information is broken down into numbers, which usually have a maximum value of 127. Why 127? Well if you look at the above table of figures, you'll see that the final binary figure is a row of seven 1s. So 127 is the largest number that can be expressed using 7 digits in the binary system.
The MIDI standard is based on the use of eight-digit binary numbers. These numbers, or units of information, or data, are called "bytes" and are said to be made up of eight "bits" rather than digits. The number 0 is sent as 00000000, 1 as 00000001, 2 as 00000010, 3 as 00000011, and so on. The first bit in each byte is used to indicate whether the byte is a "Status Byte" (a byte that commands a MIDI Device to perform a certain operation, e.g. "Key On") or a "Data Byte" (a byte that supplies the numerical value of data). So only seven bytes are used to indicate data value, from 0 to 127. For greater numerical data values, more than one byte can be sent. For example, the Pitch Bend function uses two bytes giving a total of 14 bits (numerical data range 128 x 128 = 16, 384).
Each individual bit within a byte is examined by the receiving MIDI instrument to see if it is a 1 or a 0. Hardly a complex procedure, which is why MIDI data is transferred incredibly quickly. This was agreed upon as the most economical and efficient way of expressing subtle and complex information and, simple though it seems, it does in fact enable you to create music that is MORE subtle than you can perceive!

Every time you press a key on the DX7, a variety of MIDI signals are sent extremely repidly to the TX816. These signals include Key On, Key Off, Key Pitch, Voice Number, and signals for all the Functions such as Pitch Bend, Modulation Wheel, Sustain Switch, After Touch, and so on. Sound like a lot of informaiton to send for each note, especially if you are playing repid, complex polyphonic music. But MIDI works fast--the accepted data treanmission standard for MIDI is 31.25 kilobauds, wich means 31,250 bits per second. That's fast enough for the most rapid changes in a musical program to be handled with ease.

What happens when you play a chord? The MIDI system separates out the notes in the chord, and sends the MIDI impulses serially, or one after another. True, the music is, in effect, cut up into thin "slices" of time, but just as in a movie where a projection speed of only 24 frames a second appears like smooth, uniterrupted motion, the "slices" of time are way, way too small for the ear to sperate them. Machines are much more perfect then people and this is exactly why the simple MIDI system is able to deal with the most subtle, expressive, spontaneous music that you can play.

The 31.25 kilobaud transmission rate permits an extremely useful MIDI feature-- the transmission of 16 MIDI channels on a single cable. Each MIDI signal starts with a MIDI channel number. This signal will only be receibed by an instrument set to the same MIDI channel number, or set to Omni, the mode that permits reception of all MIDI channels. In this way a single cable may be used data to sixteen instruments, each performing a different musical part. This process is utilized in system No.4 in the SYSTEMS EXAMPLES Chapter, where a CX5 Music Computer sends eight parts of music down a single cable to individually control the eight modules in the TX816.

"MIDI Formatting" is the phrase used to describe the singals that have been agreed upon to indicate various functions according to the "system exclusive information" of the Yamaha series of digital music devices. This format is not necessarily compatible with other manufacaturers' MIDI devices, apart from the basic singals such as Key On, Voice Change, etc. Every time a signal is sent, it usually consists of more than one byte. For Example, the Key On signal uses three bytes, as follows:

1. Key On, which can be notated as 1001nnnn.

This byte is also known as the Status Byte, as it tells the MIDI instrument the category of this signal, and is The Key On byte is separated into two sections:

The first half, 1001 , means "a key has been pressed" according to the MIDI format. The second half gives the MIDI channel number, from 1 to 16. Autute readers will notice that the second half has only for digits, which in the binary system allows you to express only numbers up tp 15. However, we can also express a zero, so channels numbers 1 thru 16 are expressed in this MIDI signal as 0 thru 15, subracting one from the channel number for the plurposes of transmission only. This is commonly done in the MIDI system.

2. Note Number, which can be notated as 0kkkkkk.

This indicates the pitch of the note. MIDI note numbers range from 0 to 127, incidating notes C-2 to G8 (-2 and 8 are octave numbers). This gives a range of over 10 1/2 octabes. When you think that the average grand piano has a range of less than 1 1/2 octaves, the MIDI note range is more than enogh for any musical purpose.

3. Note Velocity, which can be notated as 0vvvvvvv.

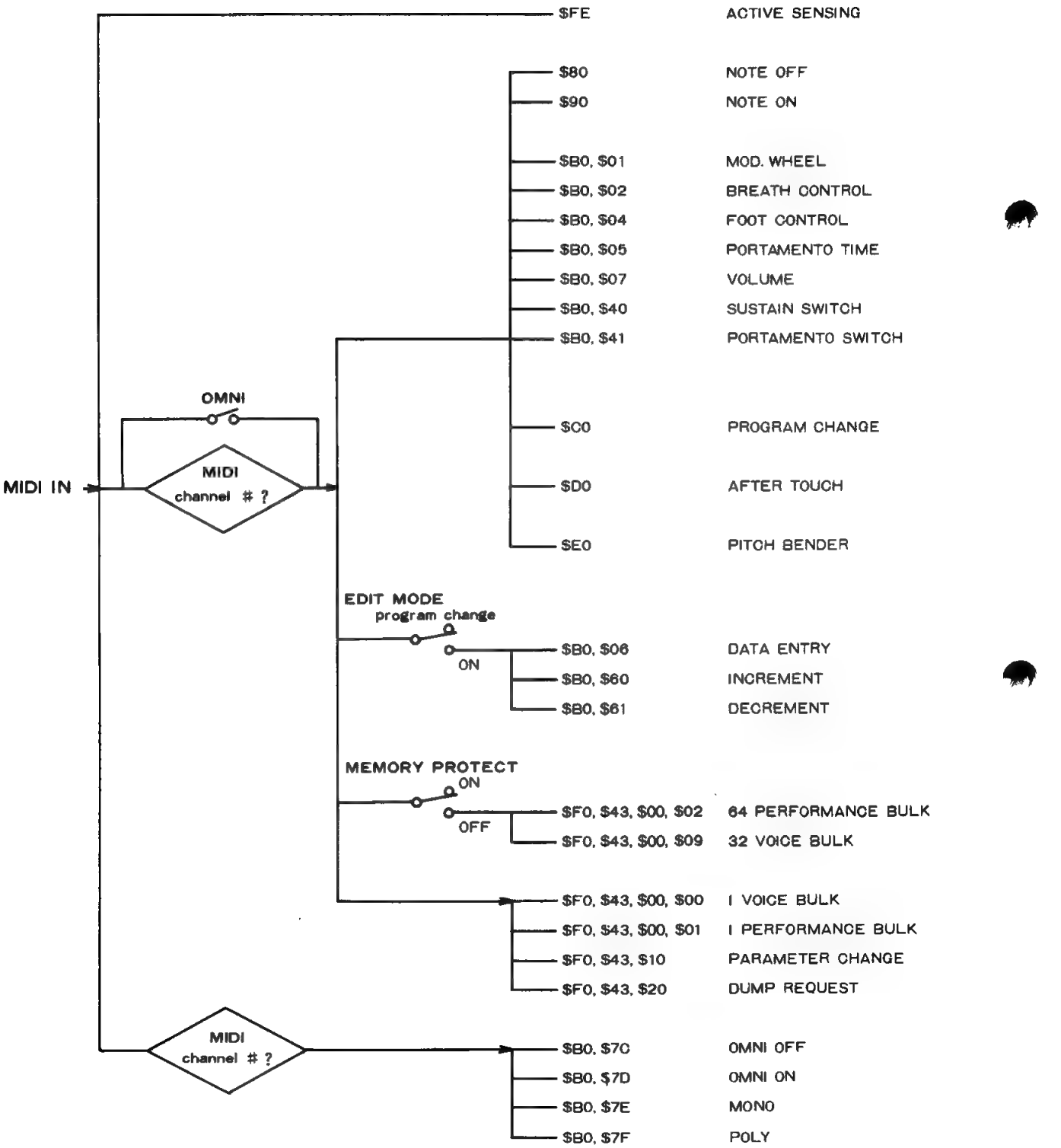
The velcity of the note (which is another way of saying how hard the note was hit) generates a MIDI number form 0 to 127 which can be used to express the volume of the note. 127 increments is more than enough to express the most subtle dynamics--if you can imagine a volume control with 127 divisions on it, this gives you an idea of the degree of subtlety available.

Further explanation of MIDI will not necessarily help you to use this system better. The whole point of the MIDI system is to make digital music systems easy to assemble and simple to use, by musicians who have neither the time nor the desire to acquire a lot of technical knowledge.

However, for computer enthusiasts who may wish to control the TX816 with instruments of their own making, or instruments outside of the Yamaha range, this manual continues with full details fo the MIDI Format of the TX816.

1. RECEPTION CONDITIONS

This chart shows the all the reception signals that can be received by the TF1. All byte numbers are expressed in hexadecimal form.



2. RECEPTION DATA

NOTE:

The meaning of letters used in byte numbers will only be given once, to save repetition. For example, the letter n in byte number 1000nnnn (Key Off Status) means MIDI channel number and will mean the same when it appears in all other byte numbers.

2-1. Reception Channel and Omni

When the TF1 is in the Play mode, you can use the keys on the front panel to set the MIDI input channel (from 1 to 16) and switch the Omni function on or off. The Omni function permits the TF1 to receive MIDI signals on all of the 16 channels. The MIDI channel and Omni settings are memorized by the TF1, and will not change even if the power is turned off.

2-2 Channel Voice Message

When MIDI channel voice messages are received, either the INDIVIDUAL or the COMMON LED will rapidly turn off then on. depending on whether the signal is input at the COMMON or INDIVIDUAL MIDI IN terminal.

2-2-1. Key Off

Status	1000nnnn n = MIDI channel number
Note Number	0kkkkkkk k = 0 (note C-2) to 127 (note G8)
Key Velocity	0vvvvvvv v:

ignore

2-2-2. Key On/OFF

Status	1001nnnn Note Number 0kkkkkkk k= 0 (note C-2) to 127 (note G8) Key Velocity 0vvvvvv v= 0 (key off) v= 1 – 127 (key on)

2-2-3. Control Change

Status	1011nnnn Control Number 0ccccccc C= 0 – 127 Control Value 0vvvvvvv v= 0 – 127

(a) control Numbers For Fixed Input

C = 1	Modulation Wheel	v = 0 – 127
C = 2	Breath Control	v = 0 – 127
C = 3	Foot Control	v = 0 – 127
C = 5	Portamento	v = 0 – 127
C = 7	Volume	v = 0 – 127
C = 64	Sustain Switch	v = 0,127
C = 65	Protamento Switch	v = 0,127

(b) Control Numbers For Front Panel Settings

These control numbers apply to the following sub-modes only; Tune Master Pitch

(Play mode), Select Program Number For Edit, and Attenuate Out put Level (Edit mode).

A: Tune Master Pitch
B: Select Program Number for Edit
C: Attenuate Output Level

			A	B	C
c=6	Data Entry	v=0-127	yes	yes	yes
c=96	Increment	v:neglect	yes	yes	no
c=97	Decrement	v:neglect	yes	yes	no

In the Select Program sub-mode you can after voice or function parameters selected with Parameter Change in system exclusive..

2-2-4. Program Change

Status 1100nnnn
Program Number 0ppppppp
Ignore the rirst two bits.
Select 1 to 32.

2-2-5. After Touch

Status 1101nnnn Pressure 0vvvvvvv

2-2-6. Pitch Bend

Status 1110nnnn
Value (LSB) 0uuuuuuu
Value (MSB) 0vvvvvvv 8 bits resoulution.
recognized.

2-3. Channel Mode Message

Status 1101nnnn
0ccccccc
0vvvvvvv

C = 124 V=0 Omni Mode OFF / ALL NOTES OFF
C = 125 V=0 Omni Mode OFF / ALL NOTES OFF
C = 126 V=1 Mono Mode OFF / ALL NOTES OFF
C = 127 V=0 Play Mode OFF / ALL NOTED OFF

Omni status (ON/OFF) is controlled on the front panel (in the OMNI ON/OFF sub-mode) and has final priority. Changes in mode are accompanied by a compulsory voice dump and cleaning of the Key assigner.

2-4. System Real Time Message

Status 11111110 Active Sensing

When this code is receifed, sensing begins. If neither status nor data is received over an interval of 300 mS, the TF1 will stop sensing after first dumping all voices and clearing the Key Assigner.

2-5. System Exclusive Message

2-5-1. Bulk Dump

(i) 1 Voice Bulk Data

Status 11110000
I.D. 01000011
Sub-status/Ch. 0000nnnn

Format Number	00000000	
Byte Count	00000001	
Byte Count	00011011	
Data	0ddddddd	
	:	155 bytes of
	:	voice data sent
	:	d=0 to 127
	0ddddddd	
Check Sum	0eeeeeee	
EOX	11110111	

This format is for the input of the data of a single voice. The green Parameter Change LED flashes when data is received. The 155 bytes okf voice data go into the Edit buffer, replacing any existing data there. The checksum (0eeeeeee) is the least significant 7 bits of the 2's complement sum of 155 data bytes. 0eeeeeee must be determined so that the least significant 7 bits of the sum of the 155 data bytes and checksum equal zero.

(ii) 1 Performance Bulk Data

Status	11110000	
I.D.	01000011	
Sub-status/Ch.	0000nnnn	
Format Number	00000001	
Byte Count	00000000	
Byte Count	01011110	
Data	0ddddddd	
	:	94 bytes of
	:	function data
	:	sent
	0ddddddd	
Check Sum	0eeeeeee	
EOX	11110111	

This format is for the input of the function data of a single voice. The green Parameter Change LED flashes when data is received. Out of the 94 bytes sent, only the data corresponding to the TF1 goes into the Edit Buffer, altering the function data of any voice currently in the Edit Buffer.

(iii) 64 Performance Buld Data

Status	11110000	
I.D.	01000011	
Sub-status/Ch.	0000nnnn	
Format Number	00000010	
Byte Count	00100000	
Byte Count	00000000	
Data	0ddddddd	
	:	4096 bytes of
	:	data sent
	0ddddddd	
Chaek sum	0eeeeee	
EOX	11110111	

This format is for loacing function data in to the TF1 Memory. It can only be input when the Memory protect is OFF. When data is input, the Memory Protect LED

will light for about 2 secounds. Only the first 32 of the 64 batches of data are loaded in order into the function memoried of program destinations 1 thru 32.

(iv) 32 Voice Bulk Data

Status	11110000	
I.D.	01000011	
Sub-status/Ch.	0000nnnn	
Format Number	00001001	
Byte Count	00100000	
Byte Count	00000000	
Data	0ddddddd	
	:	4096 bytes of
	:	data sent
	:	
0ddddddd		
Check Sum	0eeeeeee	
EOX	11110111	

This format is for loading voice data only into the TF1 memory. If can only be input when the Memory Protect is OFF. When data is input, the Memory Protect LED will light for about 2 seconds. The voice data for all 32 programs will be changed.

2-5-2. Parameter Change

Status	11110000	
I.D.	01000011	
Sub-status/Ch.	0001nnnn	
parameter		
Group Number	0ggggghh	g = 0, 1, 2, 3, 4
Parameter No.	0ppppppp	p = 0 -127
EOX	11110111	

The green Parameter Change Led will flash when data is received, and voice or function data in the Edit Buffer will be changed.

2-5-3. Dump Request

Status	11110000
I.D.	01000011
Sub-status/Ch	0010nnnn
ormat Number	0fffffff
	f = 0, 1, 2, 9, 125
EOX	11110111

The corresponding buld data will be dumped through the MIDI OUT terminal.

3. OUTPUT DATA

Data is only output when a dump request signal is received from an external source or by direct panes switching. Since the only output is the COMMON MIDI OUT terminal, you must select the OUTPUT SLOT number corresponding to the number of the module from which you are outputting data. Data is always sent via MIDI channel 1 and consists of voice and function data in System Exclusive.

3-1. Output Conditions

(a) Output for Dump Request

The following five kinds of data dump can be done, according to the selected format

number ().

f = 0 1 Voice Bulk Data
Outputs voice data in the Edit Buffer f = 1 1 Performance Bulk Data
Outputs function data in the Edit Buffer f = 2 64 Performance Bulk Data
Outputs all function data from
programs 1 thru 32 in order. f = 9 32 Voice Bulk data
Outputs all voice data from programs
1 thru 32

(Formatting for the above is the same as for input). f = 125 Condition Acknowledge

Status	11110000	
I.D.	01000011	
Sub-status/Ch.	00000000	
Format Number	01111101	
Byte Count	00000000	
Byte Count	00010000	
Data	0ddddddd	
	:	16 byte of
	:	data sent
	:	
	0ddddddd	
Check Sum	0eeeeeee	
EOX	11110111	

(b) Output in the select program sub-mode

When you select a program using the front panel keys, the corresponding voice and function data will be output in the following order:

1. 1 Performance Bulk Data 2. 1 Voice Bulk Data

(c) Output in the Dump sub-mode

Data is output in the following order when you press the "YES" key (SW1):

1. 32 Voice Bulk Data 2. 64 Performance Bulk Data

4. SYSTEM EXCLUSIVE DATA FORMAT

4-1. DX7 Voice Parameter Change (g=0)

Sub-group Number h	Parameter Number p	Parameter	Data	Notes
0	0	OP6 EG RATE 1	0 ~ 99	
	1	OP6 EG RATE 2	0 ~ 99	
	2	OP6 EG RATE 3	0 ~ 99	
	3	OP6 EG RATE 4	0 ~ 99	
	4	OP6 EG LEVEL 1	0 ~ 99	
	5	OP6 EG LEVEL 2	0 ~ 99	
	6	OP6 EG LEVEL 3	0 ~ 99	
	7	OP6 EG LEVEL 4	0 ~ 99	
	8	OP6 KEYBOARD LEVEL SCALING BREAK POINT	0 ~ 99	* 1
	9	OP6 KEYBOARD LEVEL SCALING LEFT DEPTH	0 ~ 99	
	10	OP6 KEYBOARD LEVEL SCALING RIGHT DEPTH	0 ~ 99	
	11	OP6 KEYBOARD LEVEL SCALING LEFT CURVE	0 ~ 3	* 2
	12	OP6 KEYBOARD LEVEL SCALING RIGHT CURVE	0 ~ 3	* 2
	13	OP6 KEYBOARD RATE SCALING	0 ~ 7	
	14	OP6 AMPLITUDE MODULATION SENSITIVITY	0 ~ 3	
	15	OP6 KEY VELOCITY SENSITIVITY	0 ~ 7	
	16	OP6 OPERATOR OUTPUT LEVEL	0 ~ 99	
	17	OP6 OSCILLATOR MODE	0 ~ 1	* 3
	18	OP6 OSCILLATOR FREQUENCY COARSE	0 ~ 31	* 4
	19	OP6 OSCILLATOR FREQUENCY FINE	0 ~ 99	* 4
	20	OP6 OSCILLATOR DETUNE	0 ~ 14	* 5
	21 ~ 41	OP5		
	42 ~ 62	OP4		
	63 ~ 83	OP3		
	84 ~ 104	OP2		
	105 ~ 125	OP1		
	126	PITCH EG RATE 1	0 ~ 99	
	127	PITCH EG RATE 2	0 ~ 99	
1	0 (128)	PITCH EG RATE 3	0 ~ 99	
	1 (129)	PITCH EG RATE 4	0 ~ 99	
	2 (130)	PITCH EG LEVEL 1	0 ~ 99	
	3 (131)	PITCH EG LEVEL 2	0 ~ 99	
	4 (132)	PITCH EG LEVEL 3	0 ~ 99	
	5 (133)	PITCH EG LEVEL 4	0 ~ 99	
	6 (134)	ALGORITHM SELECT	0 ~ 31	
	7 (135)	FEEDBACK	0 ~ 7	
	8 (136)	OSCILLATOR KEY SYNC	0 ~ 1	
	9 (137)	LFO SPEED	0 ~ 99	
	10 (138)	LFO DELAY	0 ~ 99	
	11 (139)	LFO PITCH MODULATION DEPTH	0 ~ 99	
	12 (140)	LFO AMPLITUDE MODULATION DEPTH	0 ~ 99	
	13 (141)	LFO KEY SYNC	0 ~ 1	
	14 (142)	LFO WAVE	0 ~ 5	* 6
	15 (143)	LFO PITCH MODULATION SENSITIVITY	0 ~ 7	
	16 (144)	TRANSPOSE	0 ~ 48	Concert pitch at 24
	17 (145)	VOICE NAME 1	ASCII	
	↓ ↓	↓ ↓	↓	
	26 (154)	VOICE NAME 10	ASCII	
1	27 (155)	OPERATOR ON/OFF	xeeeeee	* 7
	28 (156)	OPERATOR SELECT	0 ~ 5	* 8

※1 BREAK POINT

BREAK POINT	0	1	2	3	4	5	15	27	39	51	63	75	87	99
MIDI NOTE #	21	22	23	24	25	26	36	48	60	72	84	96	108	120
NOTE	A_{-1}	$A\#_{-1}$	B_{-1}	C_0	$C\#_0$	D_0	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8

※2 KEYBOARD LEVEL SCALING CURVE

	0	1	2	3
CURVE	−LIN	−EXP	+EXP	+LIN

※3 OSCILLATOR MODE

"0"……frequency ratio

"1"……fixed frequency

※4 FREQUENCY COARSE/FINE

i) For Frequency Ratio

When FINE=0

COARSE	0	1	2	3	10	30	31
FREQUENCY RATIO	0.5	1	2	3	10	30	31

When Coarse=1

FINE	0	1	2	3	10	50	99
FREQUENCY RATIO	1.00	1.01	1.02	1.03	1.10	1.50	1.99

ii) For Fixed Frequency

When FINE=0

COARSE	0	1	2	3	4	5	6	7		31
FREQUENCY(Hz)	1	10	100	1000	1	10	100	1000		1000

When COARSE=0

FINE	0	1	2	3	4	5	10	20	50	99
FREQUENCY(Hz)	1.000	1.023	1.047	1.072	1.096	1.122	1.259	1.585	3.162	9.772

※5 DETUNE

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DETUNE	−7	−6	−5	−4	−3	−2	−1	0	1	2	3	4	5	6	7

※6 LFO WAVE

	0	1	2	3	4	5
WAVE	TRIANGLE	SAW DOWN	SAW UP	SQUARE	SINE	SAMPLE/HOLD

※7 OPERATOR ON/OFF

Bit	b_5	b_4	b_3	b_2	b_1	b_0
OP	OP1	OP2	OP3	OP4	OP5	OP6

Bit Map

"0"…OFF "1"…ON

※8 OPERATOR SELECT

	0	1	2	3	4	5
OPERATOR	OP6	OP5	OP4	OP3	OP2	OP1

4-2. DX Performance Parameter Change (g=1) (h=0)

Parameter Number p	Parameter	Data	Notes
0			
1	SOURCE SELECT	1 ~ 16	※3
2	POLY/MONO	0 ~ 1	
3	PITCH BEND RANGE	0 ~ 12	
4	PITCH BEND STEP	0 ~ 12	
5	PORTAMENTO TIME	0 ~ 99	
6	PORTAMENTO/GLISSANDO	0 ~ 1	
7	PORTAMENTO MODE	0 ~ 1	※1
8			
9	MODULATION WHEEL SENSITIVITY	0 ~ 15	
10	MODULATION WHEEL ASSIGN	0 ~ 7	※2
11	FOOT CONTROLLER SENSITIVITY	0 ~ 15	
12	FOOT CONTROLLER ASSIGN	0 ~ 7	※2
13	AFTER TOUCH SENSITIVITY	0 ~ 15	
14	AFTER TOUCH ASSIGN	0 ~ 7	※2
15	BREATH CONTROLLER SENSITIVITY	0 ~ 15	
16	BREATH CONTROLLER ASSIGN	0 ~ 7	※2
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	AUDIO OUTPUT LEVEL ATTENUATOR	0 ~ 7	
27			
28			
29			
30			
31			
32			
33			
34			
↓			
63			Concert
64	MASTER TUNING	0 ~ 127	Pitch at

※1 PORTAMENTO MODE

"0"···sustain-key pitch retain

"1"···sustain-key pitch follow

※2 EFFECT ASSIGN

Bit	b_2	b_1	b_0
ASSIGN	EG BIAS	AMPLITUDE	PITCH

※3 SOURCE SELECT

Selects MIDI receive channel 1 to 16

4-3. Function Parameter Change (g=2) (h=0)

Parameter Number p	Parameter	Data	Notes
64	POLY/MONO	0 ~ 1	
65	PITCH BEND RANGE	0 ~ 12	
66	PITCH BEND STEP	0 ~ 12	
67	PORTAMENTO MODE	0 ~ 1	
68	PORTAMENTO/GLISSANDO	0 ~ 1	
69	PORTAMENTO TIME	0 ~ 99	
70	MODULATION WHEEL SENSITIVITY	0 ~ 99	※1
71	MODULATION WHEEL ASSIGN	0 ~ 7	
72	FOOT CONTROLLER SENSITIVITY	0 ~ 99	※1
73	FOOT CONTROLLER ASSIGN	0 ~ 7	
74	BREATH CONTROLLER SENSITIVITY	0 ~ 99	※1
75	BREATH CONTROLLER ASSIGN	0 ~ 7	
76	AFTER TOUCH SENSITIVITY	0 ~ 99	※1
77	AFTER TOUCH ASSIGN	0 ~ 7	

※1 EFFECT SENSITIVITY

Data received over a range of 0-99 is in the memory on a scale of 0-15

4-4. DX9 Function Parameter Change (g=3) (h=0)

Parameter Number p	Parameter	Data	Notes
64			
65	MASTER TUNE	0 ~ 127	
66	POLY/MONO	0 ~ 1	
67	PITCH BEND RANGE	0 ~ 12	
68	PORTAMENTO MODE	0 ~ 1	
69	PORTAMENTO TIME	0 ~ 99	
70	MODULATION WHEEL SENSITIVITY	0 ~ 99	※1
71	MODULATION WHEEL ASSIGN : PITCH	0 ~ 1	
72	MODULATION WHEEL ASSIGN : AMPLITUDE	0 ~ 1	
73	MODULATION WHEEL ASSIGN : EG BIAS	0 ~ 1	
74	BREATH CONTROLLER SENSITIVITY	0 ~ 99	※1
75	BREATH CONTROLLER ASSIGN : PITCH	0 ~ 1	
76	BREATH CONTROLLER ASSIGN : AMPLITUDE	0 ~ 1	
77	BREATH CONTROLLER ASSIGN : EG BIAS	0 ~ 1	

4-5. TX Function Parameter Change (g=4) (h=1)

Parameter Number p	Parameter		Data	Notes
0				
1				
2				
3				
4				
5	NOTE LIMIT LOW		0 ~ 127	
6	NOTE LIMIT HIGH		0 ~ 127	
7	TF1 MEMORY PROTECT OFF/ON		0, 127	
8	TF1 TEST PROGRAM ENTRY	FOR	127	
9	TF1 MIDI IN INDIVIDUAL	FACTORY TEST	127	
10	TF1 MIDI IN COMMON		127	

4-6.1 Voice Bulk Data

155 bytes of data. The arrangement of this data is the same as in diagram 4-1, parameters 0 thru 154.

4-7.1 Performance Bulk Data (f=1)

Parameter Number p	Parameter	Data	Notes
0			
1			
2	VOICE A POLY/MONO	0 ~ 1	
3	VOICE A PITCH BEND RANGE	0 ~ 12	
4	VOICE A PITCH BEND STEP	0 ~ 12	
5	VOICE A PORTAMENTO TIME	0 ~ 99	
6	VOICE A PORTAMENTO/GLISSANDO	0 ~ 1	
7	VOICE A PORTAMENTO MODE	0 ~ 1	
8			
9	VOICE A MODULATION WHEEL SENSITIVITY	0 ~ 15	
10	VOICE A MODULATION WHEEL ASSIGN	0 ~ 7	
11	VOICE A FOOT CONTROLLER SENSITIVITY	0 ~ 15	
12	VOICE A FOOT CONTROLLER ASSIGN	0 ~ 7	
13	VOICE A AFTER TOUCH SENSITIVITY	0 ~ 15	
14	VOICE A AFTER TOUCH ASSIGN	0 ~ 7	
15	VOICE A BREATH CONTROLLER SENSITIVITY	0 ~ 15	
16	VOICE A BREATH CONTROLLER ASSIGN	0 ~ 7	
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	VOICE A AUDIO OUTPUT LEVEL ATTENUATOR	0 ~ 7	
27			
28			
29			
30			
↓	VOICE B		
59			
60			
61	VOICE MEMORY SELECT FLAG	0 ~ 1	
62			
63			
64	PERFORMANCE NAME 1	ASCII	
65	PERFORMANCE NAME 2	ASCII	
↓	↓	ASCII	
92	PERFORMANCE NAME 29	ASCII	
93	PERFORMANCE NAME 30	ASCII	

4-8. 64 Performance Bulk Data (f=2)

Data are listed in order for the 64 performances in units of 64 bytes (64 per performance). The TF1 uses the first 32 performances.

Address	6	5	4	3	2	1	0	Parameter	Data	Parameter	Data
0	F/M							VOICE A POLY/MONO	0 ~ 1		
1	PBS(LO)			PBR				VOICE A P. BEND STEP	0 ~ 12	PITCH BEND RANGE	0 ~ 12
2	PTIM							VOICE A PORTA. TIME	0 ~ 99		
3						M	GL	VOICE A PORTA. MODE	0 ~ 1	PORTAMENTO/GLISSANDO	0 ~ 1
4	MWA			MWS				VOICE A MOD. WHEEL ASN.	0 ~ 7	MOD. WHEEL SENS.	0 ~ 15
5	FCA			FCS				VOICE A FOOT CONT. ASN.	0 ~ 7	FOOT CONT. SENS.	0 ~ 15
6	ATA			ATS				VOICE A AFTER TOUCH ASN.	0 ~ 7	AFTER TOUCH SENS.	0 ~ 15
7	BCA			BCS				VOICE A BREATH CON ASN.	0 ~ 7	BREATH CON. SENS.	0 ~ 15
8											
9											
10											
11											
12											
13											
14						ATN		VOICE A ATTENUATION	0 ~ 7		
15	PBS (Hi)							VOICE A PITCH B. STEP	(MSB)		
16											
↓	VOICE B										
31											
32						VMS	KMOD	VOICE MEMORY SELECT	0 ~ 1	KEY ASSIGN MODE	0 ~ 2
33											
34	PNAM 1							PERFORMANCE NAME 1	ASCII		
↓	↓							↓ ↓	ASCII		
63	PNAM 30							PERFORMANCE NAME30	ASCII		
	6	5	4	3	2	1	0				

With the Key Assign in Single mode(KMOD=0) Voice B are loaded with VMS.

4-9. 32 Boice Bulk Data (f=9)

Data are listed in order for the 32 programs in units of 128 bytes.

Address	6 5 4 3 2 1 0	Parameter	Data	Parameter	Data
0	R 1	OP6 EG RATE1	0 ~ 99		
1	R 2	OP6 EG RATE2	0 ~ 99		
2	R 3	OP6 EG RATE3	0 ~ 99		
3	R 4	OP6 EG RATE4	0 ~ 99		
4	L 1	OP6 EG LEVEL 1	0 ~ 99		
5	L 2	OP6 EG LEVEL 2	0 ~ 99		
6	L 3	OP6 EG LEVEL 3	0 ~ 99		
7	L 4	OP6 EG LEVEL 4	0 ~ 99		
8	B P	SCALING BREAK P.	0 ~ 99		
9	L D	SCALING LEFT DEPTH	0 ~ 99		
10	R D	SCALING RIGHT DEPTH	0 ~ 99		
11	RC / LC	SCALING RIGHT CURVE	0 ~ 3	LEFT CURVE	0 ~ 3
12	PD / RS	OSCILLATOR DETUNE	0 ~ 14	RATE SCALING	0 ~ 7
13	KVS / AMS	KEY VELOCITY SENS.	0 ~ 7	AMPLITUDE MOD. SENS.	0 ~ 3
14	O L	OUTPUT LEVEL	0 ~ 99		
15	F C / M	FREQUENCY COARSE	0 ~ 31	OSCILLATOR MODE	0 ~ 1
16	F F	FREQUENCY FINE	0 ~ 99		
17 ~ 33	O P 5				
34 ~ 50	O P 4				
51 ~ 67	O P 3				
68 ~ 84	O P 2				
85 ~ 101	O P 1				
102	P R 1	PITCH EG RATE 1	0 ~ 99		
103	P R 2	PITCH EG RATE 2	0 ~ 99		
104	P R 3	PITCH EG RATE 3	0 ~ 99		
105	P R 4	PITCH EG RATE 4	0 ~ 99		
106	P L 1	PITCH EG LEVEL 1	0 ~ 99		
107	P L 2	PITCH EG LEVEL 2	0 ~ 99		
108	P L 3	PITCH EG LEVEL 3	0 ~ 99		
109	P L 4	PITCH EG LEVEL 4	0 ~ 99		
110	ALS	ALGORITHM SELECT	0 ~ 31		
111	OKS / FB	OSCILLATOR KEY SYNC	0 ~ 1	FEEDBACK	0 ~ 7
112	L F S	LFO SPEED	0 ~ 99		
113	L F D	LFO DELAY	0 ~ 99		
114	L P M D	LFO PITCH MOD DEPTH	0 ~ 99		
115	L A M D	LFO AMP MOD DEPTH	0 ~ 99	WAVE	0 ~ 5
116	LPMS / LFW / LFKS	LFO PITCH MOD SENS.	0 ~ 7	KEY SYNC	0 ~ 1
117	T R N P	TRANSPOSE	0 ~ 48		
118	V N A M 1	VOICE NAME 1	ASCII		
119	V N A M 2	VOICE NAME 2	ASCII		
120	V N A M 3	VOICE NAME 3	ASCII		
121	V N A M 4	VOICE NAME 4	ASCII		
122	V N A M 5	VOICE NAME 5	ASCII		
123	V N A M 6	VOICE NAME 6	ASCII		
124	V N A M 7	VOICE NAME 7	ASCII		
125	V N A M 8	VOICE NAME 8	ASCII		
126	V N A M 9	VOICE NAME 9	ASCII		
127	V N A M 10	VOICE NAME 10	ASCII		
	6 5 4 3 2 1 0				

4-10. Condition Acknowledge (f=125)

Address	Parameter	Data	Notes
0	CLASSIFICATION ASCII 'L'	$4C	
1	CLASSIFICATION ASCII 'M'	$4D	
2	CLASSIFICATION ASCII '␣'	$20	
3	CLASSIFICATION ASCII '␣'	$20	
4	MODEL NAME ASCII '8'	$38	
5	MODEL NAME ASCII '9'	$39	
6	MODEL NAME ASCII '5'	$35	
7	MODEL NAME ASCII '0'	$30	
8	MODEL NAME ASCII '␣'	$20	
9	MODEL NAME ASCII '␣'	$20	
10	SOFTWARE VERSION #	V	
11	SOFTWARE REVISION #	R	
12	CONDITION DATA 1 ※1		
13	CONDITION DATA 2 RECEIVE CH	0 ~ 15	
14	CONDITION DATA 3 BATTERY VOLT		1 unit=
15	CONDITION DATA 4	0	0.1 volts

※1: Bit Arrangement

bit	Parameter	Data	Notes
b0	PERFORMANCE ECHO BACK MODE	0	
b1	COMPUTER COMMUNICATION MODE	1	
b2	VOLUME CONTROL BY DATA ENTRY LEVER	0	
b3	CONTROL CHANGE RECEIVE	1	
b4	OMNI MODE	0 / 1	
b5	MEMORY PROTECT	0 / 1	
b6	DATA ENTRY RECEIVE	0 / 1	※2

※2: "1" for Program Change sub-mode only; "0" at all other times.

[FM tone generator]
Model TF1 MIDI Implementation Chart

Date : 6/16, 1983
Version : 1.0

Function		Transmitted	Recognized	Remarks
Basic	Default	1	1-16 *	* memorized
Channel	Changed	x	1-16 *	
Mode	Default	3	1, 2, 3, 4 *	not altered
	Messages	x	POLY, MONO(M=1)	
			OMNIon, OMNIoff	
Note	True	x	0-127	
Number :	voice	**********	0-127	
Velocity	Note ON	x	o	
	Note OFF	x	x	
After	Key's	x	x	
Touch	Ch's	x	o	
Pitch Bender		x	o	
	1	x	o	Modulation wheel
	2	x	o	Breath control
	4	x	o	Foot controller
Control	5	x	o	Portamento time
	6	x	o	Data entry knob
	7	x	o	Volume
Change				
	64	x	o	Sustain foot sw
	65	x	o	Portamento f sw
	96	x	o	Data entry +1
	97	x	o	Data entry -1
Prog Change :	True #	x **********	o 0-127 0-31	
System Exclusive		o	o	Voice parameters
System	: Song Pos	x	x	
	: Song Sel	x	x	
Common	: Tune	x	x	
System	: Clock	x	x	
Real Time	:Commands	x	x	
Aux	: Local ON/OFF	x	x	
	:All Notes OFF	x	x	
Messages	: Active Sense	x	o	
	: Reset	x	x	

Notes

Mode 1: OMNI ON, POLY Mode 2: OMNI ON, MONO o: Yes
Mode 3: OMNI OFF, POLY Mode 4: OMNI OFF, MONO x: No

GLOSSARY

NOTE:

Any terms referring to parameters or functions of the DX7 are explained in its Owner's Manual (e.g. Portamento, glissando, etc.) and are not included in this glossary. The definitions explain the use of each term when applied to the tX816 or other Yamaha digital music instrument, although some general definitions are included.

Attenuate

Reduce the level of a signal. In the TF1, the Attenuate Output Level Sub-mode allows you to reduce the output level of an incivicual voice in 5 dB steps from 7 (its normal setting) thru 0.

Backup Battery

The voice and function memory in the TF1 modules are backup up by a Lithium battery so that the data is not lost when the TF1 power is turned off.

NOTE:

The battery needs replacing about every 5 years. Check its level periodically by using the Read Out Current Voltage of Battery sub-mode. See the UTILITY chapter.

Bit

The smallest unit of computer information that can be sent. For example, the binary number 1100 is a "4-bit" number. It's first bit is 1, corresponding to 'Pulse'. It's second bit is 0, corresponding to 'No pulse'. See the HOW THE MIDI SYSTEM WORKS chapter.

Binary

Refers to numbers based on powers of 2, as opposed to the normal Dicimal numbers based on powers of 10. The Binary system enables a computer to send any numerical information. See the HOW THE MIDI SYSTEM WORKS chapter.

Buffer

(see Edit Buffer)

Bulk

Describes a large amount of data, which may be transferred (dumped) in one operation. For example, the UTILITY MODE chapter describes how you can dump all the voice and function data of a TF1 into a QX1.

Byte

A group of bits. In the MIDI system, most simple commands are sent as an 8- bit byte. For example, the Program Change command (a two-byte command) contains the Status byte 1100nnnn.The first part fo this byte, 1100,means "here comes the MIDI channel number for a Program Change"; nnnn indicates the MIDI channel number, which can range from 0000 for channel 1 to 1111 for channel 16. See the HOW THE MIDI SYSTEM WORKS chapter for more explanation, and the MIDI FORMAT section for examples.

Cent

A unit of pitch measurement, equal to 1/100th of a semitone. See the Tune Master Pitch section of the PLAY MODE chapter.

Command

Another word for instruction, as applied to computers. You can command the TX816 to enter a certain mode, or to transmit data, for example.

Common

In the TX816 the COMMON MIDI IN and OUT terminal are used to send or receive MIDI signals to and from all the TF1 modules simultaneously. The TF1 modules must be switched to "COMMON" for this to occur. This is done by pressing SW1 so that the COMMON LED lights.

Daisy Chaining

A term used in the MIDI system, do describe the connecting up of two or more MIDI devices so that the same MIDI signal controls them all. For example, a single DX7 could control any numberof other DXs using the following daisy-chain procedure: Connect MIDI OUT of DX7 no.1 to MIDI IN of DX no.2. Connect MIDI THRU of DX7 no.2 to the MIDI IN of DX7 no.3. This sends DX7 no.1's MIDI signals to DX7 no.3. Further daisy-chaining is done by connecting MIDI THRU of DX7 no.3 to MIDI IN of DX7 no.4, and so on. Daisy chaining of TF1 modules is detailed in the SYSTEM EXAMPLES chapter (A Variation on System 1).

Data

Another word for computer information, of any kind. This can apply to parameters of voices, functions of voices, musical pitches or intervals, note lengths, tempos, etc.

Digital

In essence, anything expressed in numbers. Digital instruments function by reducing all the elements of sound to numbers, which can be handled, and even created, by computer technology. Digital music functions in the same way, reducing all elements of music (timing, volume, pitch, etc.) to numbers. Digital recording also reduces musical signals to numbers, so that what is stored on tape is pure information rather than audio signals, and hence is completely distortiion- free.

Disk

(see Floppy Disk)

Dump

Transfer a large amount of data from one MIDI device to another. The Dump All Voices and Function Sub-mode on the TF1 allows you to dump its entire voice data to another source, e.g. to a floppy disk where it can be permanently stored.

Edit Buffer

A temporaty store for data. When you select any voice on the TF1 for editing or play back, its data is loaded from the internal memory (where it is permanently stored) to the Edit Buffer. This data can now be edited in a variety of ways, or used to drive the FM Tone Generator in the TF1 and produce sound.

Enharmonic

Describes notes that have the same pitch but different names, e.g.C sharp and D flat. Prior to the relatively modern "well-tempered" system of tuning, two such notes would actually have different pitchs. In other words, the amount you would raise the pitch of C to get C sharp would not be the same as the amount you would lower the pitch of D to get D flat, hence the two notes would have different pitches. Consult any good musical dictionary for more information on this interesting subject. The TF1 displays pitches in sharps only (see the Limit Lowest Key section in the EDIT MODE chapter).

Floppy Disk

A compact means of storing data. Originally, computer data was stored on large reel-to reel tapes (it still is, with large computers). with the introduction of personal computers, it was possibles to store data onto requlars cassette tapes. In both these cases, finding specified data on tape meant winding through the whole tape until you reached the desired point. This is a rather slow process. Floppy disks, which are made from the same magnetic material as recording tape, allow you to find data much more quickly, by scanning across the disk in the same way that a tone arm moves across a phonograph record. Floppy disks are now the accepted way of storing data for personal computers, and come in various sizes. Yamaha's QX1

Digital Sequence Recorder uses 5 1/4" mini-disk that can store a whole album's worth of music data.

FM

Frequency modulation. A term often applied to radio broadcasting, where a "carrier" wave (with a frequency higher than the human ear can hear) has its frequency modulated by a "modulator" wave to produce audible sound in listenable frequencies. Yamaha's FM Tone Generation System, incorporated into the TF1 modules and DX synthesizers, uses a similar system to produce sounds. Up to now, most systhesizers created sounds either by filtering frequencies out of a square or sawtooth wave (analog sythesizers) or by combining sine waves at harmonic frequencies (additive synthesis). In both cases, it is difficult to create acoustic type sounds because this requires that the timbre change during the duration of a single note. The Yamaha FM Tone Generator uses six "operators"--high freguency sine waves that can act as carriers or modulators--that interact with each other to produce highly complex, changing sounds, that are simple to create and control. This unique system enables you to create incredibly realistic acoustic type voices. For a full explanation of FM,read a DX synthesizer Owner's manual.

Format

Applied to the MIDI system, this indicates the actual bytes that make up the various commnds such as "Key On". "Program Number",etc. These are listed in the MIDI FORMAT section of this manual, for users intersted in controlling the TX816 with their own ocmputers. During the initialization process of a floppy disk, the disk is divided up into sectors which are consecutively filled with data as it is entered. This arrangement is called the format, and varies from one computer to another.

Function

A parameter that affects the performance of an FM voice, rather than its actual sound. For example, Pitch Bend, Glissando, Breath Control are all functions, and can be programmed and stored into the TF1's memory. See the Edit section of the INTRODUCTION for more details.

Individual

In the INDIVIDUAL mode a TF1 module is controlled by MIDI signals sent to its INDIVIDUAL MIDI IN terminal, and is completely independent from the other TF1 modules. SW1 must be pressed to set the TF1 to INDIVIDUAL, and the corresponding LED will light up.

Initialize (floppy disks)

see Format.

Initialize (functions)

Reduce all function data in the TF1 to their original, standard settings. This can be done in one operation as described in the Clear and Initialize All Functions section of the UTYLITY chapter.

Kilobaud

A unit of measurement of the rate at which computer data is equivalent to 1000 bits per second. The standard MIDI rate is 31.25 kilbauds.

LCD

An abbreviation for Liquid Crystal Display. The DX systhesizers, RX Rhythm programmers, and QX1 Digital Sequence Recorder all have LCD's, to indicate modes, functions, data, etc. LCD's operate by using chemicals that change their light polarization characteristics when a voltage is applied to them. In combination with a constant polarized layer, the voltage- altered crystal cancels out the light completely, forming the black dots whitch create the alphabetical and numerical symbols in the display. You can test this effect by looking at an LCD with polarized sunglasses--at a certain angle the display will be complately black.

LED

An abbreviation for Light Emitting Diode. The diode glows when a voltage is applied to it. On the TF1, 5 small LED's indicate function such as INDIVIDUAL and COMMON, while an LED Display can show two alphabetical or numerical characters created by seven small diodes each, to indicate modes, data, etc.

Load

In the TF1, the process of transferring data from the internal memory to the Edit Buffer, where it can be edited or used to control the FM Tone Generator and produce sound. In general computer use, load means transferring data from permanent storage (e.g. floppy disk) to temporaty storage such as the computers fuffer.

NOTE:

The data is not actually transferred, it is copied into the new destination, and remains in fact in the original source.

Memory Protect

A safety device which prevents data stored in the TF1's internal memory from being inadvertantly deleted or altered.

MIDI

An abbreviation for Musical Instrument Digital Interface. Essentially, a means for digital devices to control each other. This system has revolutionized electrinic music and made possible the simplicity and sophistication of Yamaha's digital music instruments. See the HOW THE MIDI SYSTEM WORKS chapter.

Mode

Computer controlled instruments contain numerous microcircuits that can be used for a variety of purposes. Switching to a mode instructs the instrument to perform a specified set of functions, ususlly related to each other. For example, the TF1's Edit mode allows you to select and alter FM voices in a variety of different ways, while the Store mode lets you store voice data or function data in any selected program destination. The TX816 has four different modes.

Module

A sigle unit that performs a specified function or variety of functions, and is usually part of a larger system. The TF1 module incorporated into the TX816 Tone Generator System produces a single FM voice (although it can store the data for 32 voices) and can be played individually or sumultaneously with the other mokules in the system. It can be easily removed for repairs or battery replacement, without affecting the functioning of the other modules.

Parameter

An individual characteristic of an fM voice, which can be edited and stored. Each FM voice is created by setting the value of 145 editing parameters (voice data--listed in section 4-1 of the MIDI FORMAT chapter) and 25 Function parameters (function data--listed in the Clear and Initialize All Functions section of the UTILITY MODE chapter). When applied to mixing consoles, "parametric EQ" describes equalizers (Filters) whose frequency and bandwidth can be changed as well as their level setting.

Program

A combinaiton of voice data and function data. 32 such combinations are stored in the internal memory of each TF1. When you select a program for editing or playback, both sets of data are loadet into the Edit buffer.

Program destination

One of the 32 sections of the internal memory of the TF1, which can store both voice data and function data to make up a program. This is done in the Select Destination sub-mode (see the UTILITY MODE chapter).

RAM

An abbreviation for Random Access Memory. In a computer, the main memory is a RAM, where programs are stored and are always available, prior to being permanently stored on tape or floppy disk. Applied to the DX7, RAM does not refer to the internal memory (although it is, in fact, a RAM).It refers to the RAM cartridges which are purchased separately from the DX7. These cartridges hold the voice data for 32 voices, and are truly random access because each voice can be loaded into or read fom the cartridge sopeparately from the others. DX7 RAM cartridges differ from conventional RAM's in that they retain their memory after power is turned off, without the use of a basckup battery. This is due to their special EEPROM (Electrically Erasable Programmable Read Only Memory) technologey. RAM cartridges can not be used to store function data from the DX7, but function data may be stored on RAM cartridges using the DX5 or DX1. However, function data may be stored on the QX1's floppy disk.

Real Time

Indicates the reception of data at the same speed at which it is created. With the Yamaha QX1 Digital Sequence Recorder, real time refers to the fact that the QX1 can accept the data created by a live performance on a MIDI instrument, no matter how rapid or complex the music may be.

ROM

An abbreviation for Read Only Memory. Data cannot be entered into this kind of memory; it can only be read from it. The DX synthesizers and KX remote keyboards contain ROMs (not user accessible).The DX1 is cupplied with 2 per-programmed ROM cartridges containing 64 voices each, and a Performance ROM cartridge containing 64 voice number/function data combinations. These cartridges are not user programmable--they have fixed memories.

Save

A word meaning the transfer of data from a temporary store to a permanent store. For example, you can "save" DX7 voice data on a RAM cartridge, or if you are using the CX5M Music Computer with the FM Music Composer program carttidge, you can "save" the music data onto a standard cassette tape.

Sequencer

A device that records data in a specific order, so that it can be recalled in its original sequence, and edited or rearranged. The Yamaha QX1 Digital Sequence Recorder is a sophisticated sequencer. It can convert a live (real time) performance On a MIDI instrument into data which is stored in sequence and can be played back at any tempo or in any key, and may be edited to any degree. It can also accept music data one note at a time from its own computer-type keyboard, so that music may be programmed in by users who cannot play a music keyboard.

Sub-mode

Computer-controlled instruments such as the TX816 usually have various modes in which they function. Each mode contains several sub-modes, which enable the instrument to carry out a specific function. For example, the Attenuate Output Level sub-mode in the EDIT mode of the TX816 lets you alter the output level of any individual program in a TF1 module. The TX816 has a total of 14 different sub-modes, all entered by pressing SW3.

System Exclusive Information

Applies to formats or commands that function only within a given system. For example, the TX816 can be played by virtually any MIDI instrument, but its voices can only be edited by DX synthesizers, due to the System Exclusive Information (specific MIDI commands) that is required to alter voice and function data. A DX keyboard can be switched between SYS INFO UNAVAIL (System Exclusive Information Unavailable--functions like any basic MIDI instrument to SYS INFO AVAIL (System Exclusive Information Abailable--can transmit MIDI commands exclusive to Yamaha digital instruments) for editing purposes.

Voice

A sound created by the FM Tone Generator when the appropriate data is loaded into it from the Edit Buffer of a TF1 or DX keyboard. Each voice is created by setting 145 parameters (listed in section 4-1 of the MIDI FORMAT chapter).Voice Data refers to the parameters that create the sound of an FM voice, as oppesed to Function data (see above in glossary), which controls the performance characteristics of a voice. Voice data is stored separately from function data in the TF1's memory, and is available for editing.

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NOTE:

All modes and sub-modes have their initial letters capitalized, e.g. Store Only Function.

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ADDING MORE MODULES TO THE TX216

Adding more TF1 modules to the TX216 is a very simply done, and will greastly increase its performance potential. You can add up to six more modules, making a total of eight, in which case your TX216 would then function in exactly the same way as a TX816. This how it's done:

PLEASE READ THE FOLLOWING PRECAUTIOHS BEFORE INSTALLING A TF1:

++DO NOT touch the printed circuit board on the TF1. It is highly sensitive and can easily be damaged by static electricity.

++DO NOT touch or in anby way stain the gold-plated card edge connectors on the TF1. It must be kept absolutely clean and untarnished, so that good contacts may be made when it is inserted.

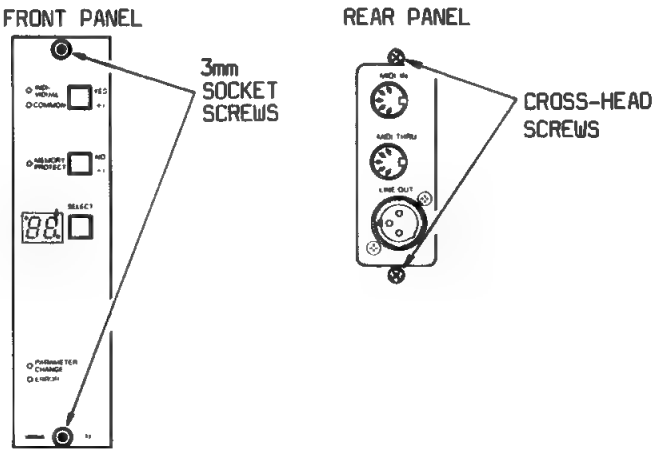
++DO NOT remove the TF1 unless it is absolutely necessary (e.g. for a battery change). The card edge connectors cannot stand up to repeated removals and installations.

++DO NOT place the TF1's circuit board close to any kind of electrical conductor, or the lithium battery will be laiable to discharge.

1. Switch the power OFF and unplug the TX216 from the AC supply.
2. Remove the front and rear blanc panels from the MIDI rack frame, at the location you have selected for your TF1. Use the 3mm socket wrench supplied with your TX216 or TF1 to take out the socket screws holding the front panel, and a philips (crosshead) screwdriver for the rear panel screws.
3. Gently slide the TF1 into place.
4. Secure the TF1 by replacing the panels and tightening the screws.

NOTE:

For each TF1 that you add to your TX216, the power consuption will increase by about 7 watts, and the weight will increase by 600 g.



SAMPLE CHART

	TITLE	1	2	3	4	5	6	7	8	REMARKS	
1	STRINGS	BASS	BASS	CELLO	CELLO	VIOLA	VIOLA	VIOLIN	VIOLIN		1
2	PIANO × 8	LO ———							→ HI	PIANO VOICES 1 → 8 SPREAD OVER KEYBOARD	2
3	E PNO/CLAV/BRASS	E.P. 1 (L)	E.P. 2 (R)	CLAV. 1 (L)	CLAV. 2 (R)	BRASS L	BRASS C	BRASS C	BRASS R	BREATH CONTROL ON BRASS	3
4	PIANO/CHOIR	PNO 1	PNO 2	PINO 3	PINO 4	CHOIR 1	CHOIR 2	CHOIR 3	CHOIR 4	FOOT CONTROL TO FADE IN CHOIR	4
5	RHODES CHORUS	RHODES 1 ———	→	THRU ———					→ 8	DETUNE TO THESE SETTINGS: 0, 3, 6, 9, 12, 15, 18, 21	5
6	BRASS 〃	BRASS 1 ———	→	THRU ———					→ 8	〃	6
7	STRING 〃	STRING 1 ———	→	THRU ———					→ 8	〃	7
8	VIBES 〃	VIBES 1 ———	→	THRU ———					→ 8	〃	8
9	HONKY TONK PIANO	PIANO 1 ———	→	THRU ———					→ 8	DETUNE TO 0, 5, 10, 15, 20, 25, 30, 35	9
10	ATONAL MARIMBA	MAR 1 ———	→	THRU ———					→ 8	DETUNE TO -60, -45, -30, -15, 0, 20, 40, 60	10
11	ATONAL BRASS	BRASS 1 ———	→	THRU ———					→ 8	〃	11
12	JAMAICA!	MAR	MAR	STEEL ĐR	STEEL ĐR	BRASS 1 ———			→ 4	BREATH CONTROL ON BRASS	12
13	AFRICA!	WOOD BLOCK ①	LOG ĐRUM ①	TOM 1 ②	TOM 2 ②	THUMB PIANO ③	FLUTE ④	GTR ⑤	GTR ⑤	NUMBERS REFER TO 8X7 OCTAVES	13
14	BRAZIL!	WOOD BLOCK ①	COWBELL ①	CLAVES ②	CLAVES ③	SHAKER ④	SCRAPER ④	BONGO ⑤	BONGO ⑤	〃	14
15	ĐRUM SPLIT	B. Đ.	TOM 1	TOM 2	TOM 3	SNARE	HI-HAT	CYMBAL	COWBELL		15
16	CHURCH ORGAN I	16 ft	16 ft	8 ft	8 ft	4 ft	2 2/3 ft	2 ft	1 1/3 ft	LOW	16
17	CHURCH ORGAN II	8 ft	8 ft	5 1/3 ft	4 ft	2 ft	1 1/2 ft	1 ft	1/2 ft	HIGH	17
18	ROCK	BASS	E. P.	HORNS	LEAĐ GTR.	CLAV.	SYNTH	PERC.	RHYTHM GTR	FOR QX1 PLAYBACK	18
19	NEW WAVE	SYN BASS	CLAV	ELEC. SNARE	BIRĐ SOUNĐ	SYN LO	SYN HI	ARPEGGIOS	60's ORGAN	〃	19
20	CLASSICAL	CELLO	VIOLA	VIOLIN	FR. HORN	TYMPUS	HPSCHĐ	OBOE	FLUTE	〃	20
21	AMBIENT	VIBES 1	VIBES 2	VIBES 3	PIANO 1	PIANO 2	FLUTES	STRINGS	CHOIR	〃	21
22	JAZZ	FRETLESS BASS	ELEC. ORG.	PNO	SAX (B.C.)	GTR	CLAR	TROMBONE	TRUMPET	〃	22
23	CHOIR	BASS	BASS	TENOR	TENOR	ALTO	ALTO	SOP	SOP	〃	23
24	ELECTRONIC I	BUMP	SQUAWK	SQEAK	SCREECH	THUĐ	WASH	TINGLE	WARBLE	〃	24
25	ELECTRONIC II	WHINE	WAVE	WAIL	WHISTLE	PLOP	HOWL	WINĐ	CHIMES	〃	25
26	BIRĐ FX	BIRĐ 1 ———	→	THRU ———					→ 8	〃	26
27	FOLK MUSIC	HARP I	HARP II	BAGPIPE	ĐRUM	VIOLIN	WHISTLE	FLUTE	BELL	〃	27
28	CHURCH BELLS	BELL A	B	C	Đ	E	F	F#	G	〃	28
29	SPACE FX	LOW HUM	MIĐ HUM	STAR CHIME	BLEEP	BLOOP	STRING FAĐE	WAILING	SHUĐĐER	〃	29
30	ECHO'Đ FLUTE	FLUTE	ECHO 1	ECHO 2	ECHO 3	ECHO 4	ECHO 5	ECHO 6	ECHO 7	CLOCK MOVES " MAKE ECHOES	30
31	COMMERCIAL I	BASS	PIANO	GTR	ORGAN	SAX (B.C.)	HARP	VIOLIN	VIOLA	〃	31
32	COMMERCIAL II	BASS	EL-PNO	FLUTE	OBOE	TROMBONE	TUBA	GLOCK	CLARINET	〃	32

TX816 VOICE CHART

	TITLE	1	2	3	4
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5	6	7	8	REMARKS	
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FCC CERTIFICATION (USA)

While the following statements are provided to comply with FCC Regulations in the United States, the corrective measures listed below are applicale worlewide.

This series of Yamaha combo equipments use frequencies that appear in the radio frequency range and if installed in the immediate proximity of some types of audio or video devices (within three meters), interference may occur. This series of Yamaha combo equipment have been type tested and found to comply with the specifications set for a class B computing device in accordance with those specifications listed in subparts J of parts 15 of the FCC rules. These rules are designed to provide a reasonable measure of protection against such interference. However, this does not guarantee that interference will not occur. If your combo equipment should be suspected of causting interference with other electronic devices, verification can be made by turnign your combo equipment off and on. If the interference continues when your equipment is off the equipment is not the source of interference. If your equipment does appear to be the source of the interference, you should try to correct the situation by using one or more of the following measures:

Relocate either the equipment or the electronic device that is being affected by the interference. Unilize power outlets for the combo equipment and the device being affected that are on defferent branch (circuit breaker or fuse) circuits, or install AC line filters.

In the case of radio or TV interference, relocate the antenna or, if the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable. If these corrective measures do not produce satisfactory results, please contact your franctised Yamaha combo equipment dealer for suggestions and/or corrective measures. If You cannot locate a franchised Yamaha combo equipment dealer in your general area contact the Combo Service Department, Yamaha International, 6600 Orangethrope Ave., Buena Park, CA 90620, U.S.A.

If your any reason, you should need additional information relating to radio or TV interference, you may find a booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio -- TV Interference Prdoblems". This booklet is abailable from the U.S. Government Printing Office, Washington D.C. 20402--Stock No. 004-000-00345-4.

SINCE 1887 YAMAHA

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN

OMD-106N 85 03 1.5 CR Printed in Japan